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Once upon a clinical leader...

Folktales have existed for centuries and often provide a roadmap, of sorts, to success. They share whimsical yet powerful images, messages and lessons aimed at guiding children to live honestly, to explore, to be adventurous and creative, to overcome adversity and ultimately to find happiness and success.

There is usually a brave ‘hero’ (or ‘leader’) in a folktale who takes responsibility and inspires, motivates, encourages, guides, overcomes and is brave enough to do what others cannot or will not. These leaders can see beyond their current situation, hold a vision, express it clearly to others, believe that it is possible and make it happen.

Of course heroes and leaders like these do not just exist in folktales. In healthcare they are not always those who hold specific management or executive positions. Often they are simply the individuals who are brave enough to ask the challenging questions, like, ‘if I did this differently, what could I achieve?’ It is these individuals who spark engagement around shared responsibility for continuous quality improvement, be it across an entire facility or in relation to a single patient or client.

Generating solutions based on ‘possibilities’ and how things could be done differently is no easy task, and it relies on not only knowledge but also the ability and personality to inspire others to work together.

The Joanna Briggs Institute Evidence Based Clinical Fellowship program is aimed at celebrating the skills of these individuals and facilitating their further growth and development. They are indeed heroes within their contexts who strive to improve care provision and health outcomes for patients. Every report in this monograph series is a testimony to their courage, creativity and determination to make a difference, whatever part of the world they are from.

These individuals and their achievements are not the stuff of fairy tales or folklore. While others may dream of the possibilities, these clinical leaders take it upon themselves to make change a reality.

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The Joanna Briggs Institute
Hand hygiene adherence amongst healthcare providers in radiation therapy centres: a quality improvement project

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Abstract

Aim:
The aim of this project is to improve adherence to hand hygiene practices amongst healthcare providers working in radiation therapy centres using the six-step hand hygiene technique together with ‘My 5 moments for hand hygiene’ concept developed by the World Health Organisation (WHO).

Method:
The team utilised the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research Into Practice (GRIP) programs to guide them in team setting up, conduct pre- and post implementation audits using evidence-based criteria and implement change. The implementation period of the project was July 2011 to November 2011, carried out over three different phases.

Results:
The post implementation results showed an improvement in all criteria except criterion 5. Adherence rate for criterion 2 showed a slight improvement of 28% (36% to 64%). There was a remarkable improvement of 73% (0 to 73%) in criterion 3. Another remarkable improvement in adherence was criterion 4, which showed an improvement of 72% (10% to 82%). Criterion 5 showed a reduction of 12% in adherence (100% to 88%). For criterion 1 and 6 there was no change in the adherence rate.

Conclusion:
The improvement of adherence in five out of the six criteria in hand hygiene was possible because of the teamwork and dedication of the project team. The team also gained knowledge and skills in enhancing their leadership role in conducting this project. Sustaining the outcomes is an ongoing challenge and the team developed different strategies in maintaining positive outcomes.

Keywords:
adherence, audit, hand hygiene, healthcare associated infection, radiation therapy

Background

The term hand hygiene refers to the application of soap/solution (non-antimicrobial or antimicrobial) and water, or a waterless antimicrobial agent to the surface of the hands. It is a crucial measure for preventing the spread of antimicrobial resistance and healthcare-associated infections (HCAI). The hands of healthcare providers contribute to the spread of HCAIs and are the most common source for the transmission of infection from patient to patient and within the healthcare environment. HCAI not only continue to affect patient morbidity and mortality, they also contribute to the rising cost of healthcare. Evidence-based practice outcomes associated with adequate hand hygiene adherence and improved surveillance of HCAI can improve patient care overall and decrease HCAI.

Thus, monitoring hand hygiene adherence on healthcare providers is a critical component of multimodal hand hygiene promotion programs. Although hand hygiene promotion programs have been in place for several decades in many worldwide healthcare settings, adherence with hand hygiene practices remains below an acceptable level. Some studies have identified multiple factors that influence hand hygiene adherence and may vary according to the setting, resources available, knowledge deficits and healthcare providers’ social behaviour.
In 2006, on the launch of the program, SAVES LIVES: Clean your Hands initiative, WHO Patient Safety issued the World Health Organisation’s Guidelines on Hand Hygiene in Healthcare. The guidelines provide an extensive summary of essential aspects of hand hygiene in healthcare, evidence- and consensus-based recommendations for successful practice promotion. In conjunction with the production of the guidelines and to assist healthcare settings translate the guidelines into practice, WHO developed the WHO Multimodal Hand Hygiene improvement Strategy program together with wide varieties of implementation tools. In 2009, many international healthcare settings adopted the guidelines together with the Multimodal Hand Hygiene improvement Strategy program. These initiatives have become the gold standard for hand hygiene practice globally.

An innovative concept, ‘My 5 moments for hand hygiene,’ is the key element of the implementation tool in this strategy program. The five essentials moments encourage the healthcare providers to clean their hands (1) before touching a patient, (2) before clean/aseptic procedures, (3) after body fluid exposure/risk, (4) after touching a patient and (5) after touching the surroundings.

The Infection Control Team of the National University Hospital (NUH), a 990-bed acute care teaching hospital, adopted the WHO Hand Hygiene Guidelines and launched a campaign involving intensive hand hygiene education to all healthcare providers. The campaign emphasised the six-step hand hygiene technique together with the ‘My 5 moments for hand hygiene’ concept. The team also ensured that there was accessibility to cleaning products at all hand-sanitizing stations in the common patient care area. Thus, hand hygiene adherence became a significant quality initiative at NUH. After the launch of the campaign, the hospital-wide average adherence rate for the in-patient setting improved from 31% in 2008 to 71% in 2010.

The Radiation Therapy Centre in the NUH is an outpatient setting that provides radiation treatment to about 60 haematology-oncology patients diagnosed with cancer. Successful treatment methods for cancer such as chemotherapy and radiotherapy have contributed to a rising number of immune-compromised patients who are at risk for life-threatening healthcare associated infections (HCAI). Factors contributing to the rise of HCAI in patients with cancer may include an increase in antimicrobial resistance and treatment effects of radiation and chemotherapeutic agents. Infection control and prevention practices such as proper hand hygiene practices can decrease infection rates among patients with cancer.

Hence, to minimise cross transmission of microorganisms, it is essential that healthcare providers working in radiation therapy centres practise proper hand hygiene techniques. The recent hand hygiene audit, conducted by the Infection Control Team from April to June 2011, showed an average adherence rate of 40%. This audit result is far below the hospital’s target achievement adherence rate of 75%.

One of the main factors that contributed to the low adherence rate was that healthcare providers did not perform the six-step hand hygiene technique together with ‘My 5 moments for hand hygiene’ concept correctly. Thus, the low adherence rate on hand hygiene of the centre will be a prime motivator for the centre to form a team to implement strategies in improving hand hygiene practices amongst healthcare providers. These healthcare providers include the radiation therapists, registered nurses and ancillary staff who assist the physician in the consultation room.

Audit question
To what extent are we encouraging healthcare providers working in radiation therapy centres to practise the six-step hand hygiene technique together with ‘My 5 moments for hand hygiene’ concept correctly?

Aims
The aim of this project was to improve adherence of hand hygiene practices amongst healthcare providers working in radiation therapy centres using the six-step hand hygiene technique together with ‘My 5 moments for hand hygiene’ concept.

The specific aims of this project were to:

- Educate all healthcare providers on the indications for practising hand hygiene using the six-step hand hygiene technique together with ‘My 5 moments for hand hygiene’ concept
- Improve hand hygiene practices by identifying barriers and implement initiatives recommended by the World Health Organisation (WHO) multimodal hand hygiene improvement strategy
- Audit adherence by utilising the evidence-based criteria embedded within the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and GRIP (Getting Research Into Practice) program to implement change.
Methods
The team utilised the JBI–PACES and GRIP programs to guide them in team set-up to conduct pre- and post implementation audits using evidence based criteria and to implement change.\textsuperscript{12} The implementation period of the project was from July 2011 to November 2011 and was carried out in three phases.

Ethical considerations
This project was in alignment with the hospital infection control’s initiative in improving patient safety. Thus, it did not require formal ethical approval, as there was no identifiable detail required during data collection. The team maintained patients’ and healthcare providers’ confidentiality and privacy at all times.

Phase 1: Preparation of the audit
Identification of the topic:
The topic identified for the audit was hand hygiene practices amongst the healthcare providers working in NUH Radiation Therapy Centre. The team selected the topic because of the low adherence rate amongst all the other key performance indicators in the centre. Apart from hand hygiene, other indicators were medication errors, sharps injuries, falls and others that related to patient safety issues.

Establishment of audit team:
The key stakeholders were the chief radiation therapist and the assistant manager of the centre. The team leader of the project was a senior registered nurse working in the centre and her other team members comprised another senior registered nurse and a radiation therapist. Both team members worked together with the team leader in the same unit. They were selected to be the in the team because of their expertise, and their roles and responsibilities in their respective areas.

The team leader held a meeting to introduce the project to the members and the stakeholders before implementing the project. In the meeting, the team leader maintained a two-way communication at all times with stakeholders and members to enable constructive feedback. The contents discussed in the meeting were the importance of the topic, audit and adherence criteria, and the implementation plan. The team leader met with team members every fortnightly to provide direction and to rectify problems encountered during the implementation phase of the project. The audit team, which comprised the team leader and a senior registered nurse who was also the infection control liaison nurse (LCLN) of the centre, were given a specific timeframe to conduct and analyse audit using the online PACES and GRIP program.

Setting and sample:
This project took place at the radiation therapy centre, an outpatient setting facility situated within a 900-bed acute care teaching hospital in Singapore. There were 22 multi-disciplinary healthcare providers working in the centre; however, the project team decided to select only 11 healthcare providers to determine if they performed hand hygiene practices correctly. These healthcare providers comprised six radiation therapists, two registered nurses and three ancillary staff. They were selected because their job assignments involved direct contact patient care.
Audit criteria:
The team utilised six out of the seven audit criteria generated from JBI-PACES to conduct the pre- and post-implementation audit. The team excluded one of the criteria because the team had agreed that the other six criteria were sufficient as basis of their observation of staff in performing hand hygiene practices using the ‘My 5 moments for hand hygiene’ concept.

The auditor considered that compliance was met for criteria 1, 2, 3, 4 and 5 if the auditor observed that a healthcare provider performed the stated criteria as described. For criteria 6, the auditor considered that compliance was met if there is a record of a healthcare provider in attendance at a hand hygiene education program conducted by the infection control team of the hospital.

**Criterion 1:**
Alcohol-based hand rub is routinely used for hand hygiene unless hands are visibly soiled.

**Criterion 2:**
Hands are decontaminated immediately after contact with individual patient and/or all inanimate objects including equipment.

**Criterion 3:**
Hands are decontaminated immediately before contact with individual patient and/or all inanimate objects including equipment.

**Criterion 4:**
Hands are decontaminated with an alcohol-based hand rub (unless hands are visibly soiled) from different care activities for the same patient.

**Criterion 5:**
Hands that are visibly soiled, or potentially grossly contaminated with dirt or organic material, are washed with liquid soap and water (organic material may include but not limited to body fluids or excretions, mucous membrane, non-intact skin or wound dressings).

**Criterion 6:**
Staff members have received education about hand hygiene.

Conducting the pre-implementation audit:
The team leader and another registered nurse played the role of an auditor in the pre-implementation audit. The auditors utilised the direct observation method in conducting the audit, as recommended by the WHO. The WHO organisation considers this method as the gold standard and most reliable method for measuring adherence rates of hand hygiene.

The pre-implementation audit lasted over a two-week period from 18 July 2011 to 29 July 2011. In the first week of the audit, the first auditor conducted the audit on the radiation therapists upon the start of the patient receiving radiotherapy treatment. The second auditor conducted the audit in the second week upon registered nurses performing catheterization on patients receiving the 3-channel Brachytherapy procedure. The auditor continued to conduct the audit on the ancillary staff whenever they were chaperoning the patients in the consultation room. Both auditors used the JBI-PACES best practice criteria in guiding them to develop an audit tool tailored to their own setting. The auditors used this audit tool to record the data and entered it manually into the JBI-PACES program.

Phase 2: Implementation of best practice
Group participation in discussion of pre-implementation results
The team leader started the meeting by sharing the pre-implementation results to the key stakeholders and team members in the meeting. The gaps and variation in practices from the non-adherence criteria were the key topic for group discussion. The team leader facilitated the discussion by encouraging a two-way communication to promote constructive feedback.
Use of GRIP to document barriers, strategies and resources required

The team utilised the GRIP program to identify gaps and barriers related to the low adherence rate for criterion 2, 3 and 4. The GRIP process consists of three main activities: situation analysis, action planning and action taking. As shown in Table 1, there were four barriers identified in the situation analysis. The first barrier was the lack of knowledge on the importance of hand hygiene. The second barrier was staff being too busy and forgetting to use the hand rub either before or after contact with the patient or equipment. The third and fourth barriers were that hand rubs were not available at the point of care and that the hand rub was likely to cause dryness of skin. The team brainstormed strategies related to barriers and possible interventions to increase adherence for hand hygiene practices before commencing the post implementation audit. The team came up with the following plan of action as stated in Table 1:

1. Conduct workshops to re-educate staff on the importance of hand hygiene practices.
2. Conduct one-to-one teaching at the clinical area if staff members do not adhere to proper hand hygiene practices.
3. Work with the Maintenance Department to wall-mount alcohol-based hand rubs at convenient points in the care area.
4. Educate staff members in the use of moisturising hand cream at regular intervals, for example, at tea or coffee breaks, lunch time or at the end of the day.
5. Source for hand rub products with moisturising components.

Phase 3: Post implementation audit

Three months after the implementation of practice change, the audit team conducted another audit using the same methodology as the pre-implementation audit. The audit team conducted the post implementation audit from 30 October 2011 to 11 November 2011.

Results

Pre-implementation audit results

Figure 1 shows the results of pre-implementation audits. The results of the pre-implementation audit reflect poor adherence in hand hygiene practices for criterion 2, 3 and 4. For criterion 2, only 36% of staff members used hand rubs immediately after contact with individual patients and/or equipment. For criterion 3, none of the healthcare providers audited used hand rubs immediately before contact with individual patients and/or equipment. In addition, for criterion 4, only 10% of staff used hand rubs between different care activities for the same patient. For criteria 1 and 6, the adherence rate was 100%.

Post implementation audit results

The post implementation results (Figure 2) showed that there was an improvement for all criteria except for criterion 5. The adherence rate for criterion 2 showed a slight improvement of 28% for healthcare providers performing hand hygiene immediately after contact with individual patient (36% to 64%). There was a remarkable improvement of 73% for criterion 3, which indicated that the healthcare providers audited used hand rubs immediately before each episode of direct patient contact (0 to 73%). Another remarkable improvement in adherence was for criterion 4, which showed an improvement of 72%. This result indicates that the healthcare providers were more aware of using alcohol-based hand rubs between different care activities for the same patient, which showed a significant improvement in adherence from 10% to 82%.

The only criterion that showed a reduction in adherence rate was criterion 5. For this criterion ie healthcare providers washing their hands with soap and water if hands are visibly soiled, there was a reduction of 12% in adherence from 100% to 88%. The criteria that recorded no change in adherence rates were criteria 1 and 6. These two criteria had achieved a 100% adherence in the post implementation audit.
Discussion

The team utilised the tools in JBI-PACES and GRIP for the first time in conducting this evidence-based utilisation project. The team found that the tools were useful in effecting practice change for the centre. In this hand hygiene project, the team felt encouraged that the interventions had produced positive outcomes for all six criteria, except for criterion 5. The team designed and implemented these interventions to overcome the barriers and improved adherence for the hand hygiene project.

In the first intervention, the team conducted four education workshops to educate healthcare providers on the importance of hand hygiene practices, which is one of the barriers identified in the GRIP process. In the education workshop, one of the teaching methods used was getting the healthcare providers to watch the video on the ‘My 5 moments for hand hygiene’ concept. This video demonstrated the critical times to practise hand hygiene, and this had helped the healthcare providers to have an in-depth understanding on the ‘My 5 moments for hand hygiene’ concept. Thus, it might imply that the improvement of adherence in criteria 2, 3 and 4 was attributable to the four education workshops conducted for all the healthcare providers.

Another education activity that might contribute to the improvement of adherence to the criterion 2, 3 and 4 was the one-on-one teaching provided by the audit team for the non-adherence healthcare providers during the implementation phase. The healthcare providers, who did not adhere to the proper hand hygiene practice in the busy clinical area, received one-on-one teaching from the audit team. This method not only helped the non-adherence healthcare providers to be more aware of their own mistakes, it also potentially increased their adherence with hand hygiene even when they were busy.

The use of hand moisturisers to counteract the drying effects of the alcohol-based products is particularly beneficial in helping to maintain the integrity of the skin. However, healthcare providers had often overlooked or ignored it. Thus, to encourage healthcare providers protect their hands from dryness, the team leader ensured that hand moisturizers were available at the staff restrooms to encourage them to moisturise their hands when at rest. In addition, the team leader also sourced for new hand rub products with moisturising components and ensured that they were wall mounted at point-of-care areas. This strategy could have reduced the resistance by the healthcare providers in not using hand rubs as a hand hygiene practice. Thus, adherence in hand hygiene practice improved.

Criteria 1 and 6 achieved 100% adherence by the 11 healthcare providers in the pre- and post-implementation audit results. This could be attributable to the continuous effort of the hospital infection control team. For criterion 1, relating to healthcare providers using alcohol-based hand rubs routinely, and criterion 6, relating to educational programs on hand hygiene, the team played a key role in overcoming infrastructure barriers at the hospital and increase in awareness after the launch of the hospital hand hygiene campaign in 2009.

Sustainment

Sustaining the improved adherence in hand hygiene practices at the Radiation Therapy Centre is going to be an ongoing challenge. The team planned to continue to monitor the adherence on hand hygiene as a monthly audit activity. At the department meeting, the team leader will continue to share results of the hand hygiene adherence, which had previously not been included in meeting agendas. The team will now celebrate by having a tea party at the department meeting if the monthly adherence rate of hand hygiene improves. Rewarding hand hygiene role models with shopping vouchers or movie tickets is another incentive to motivate others to perform right hand practices.

Conclusion

This project showed the use of pre- and post implementation audits as a method of translating evidence into practice. The audit team utilised the ‘gold standard’ of direct observation as recommended by WHO to conduct the audit.10 The improvement in adherence rates in five out of the six criteria in hand hygiene was possible because of teamwork and dedication of the project team. The team also gained knowledge and skills in enhancing their leadership role in conducting this project. Sustaining the outcomes is an ongoing challenge and the team developed different strategies in maintaining the positive outcome.
Acknowledgements
The author would like to thank the Michelle Tan, Assistant Manager, and Mary Chan, Senior Radiotherapist, for their continuous support in this project. The author would also like to acknowledge the following staff of the Radiation Therapy Centre who contributed as members of the project team: Cui Jie Ting and Yvonne Loh. In addition, the author appreciates the support from Dr Emily Ang and Senior Nurse Clinician Chow Ying Leng for their guidance on the Evidence-based Clinical Fellowship Program.

References
Table 1: Summary of the three activities – situational analysis, action planning and action taking undertaken during the GRIP phase to implement best practice in hand hygiene

<table>
<thead>
<tr>
<th>Situational analysis</th>
<th>Action planning</th>
<th>Action taken</th>
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<tbody>
<tr>
<td>Lack of knowledge on the importance of hand hygiene</td>
<td>Conduct workshops to re-educate staff on hand hygiene practices</td>
<td>Four workshops conducted by the team leader. Workshop started off with a) PowerPoint presentation on how suboptimal hand hygiene adherence increases the risk of HCAI and kills patients</td>
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<tr>
<td></td>
<td></td>
<td>b) Video showing the “My 5 moments for hand hygiene”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) Interactive group discussion on the importance of good hand hygiene practices</td>
</tr>
<tr>
<td>Healthcare providers were too busy and had forgotten to perform hand rubs either before or after contact with patient or equipment.</td>
<td>Conduct one-on-one teaching at the clinical area if healthcare providers do not adhere to the proper hand hygiene practices</td>
<td>The audit team identified non-adherence healthcare providers during the implementation phase and provided one-on-one teaching at the clinical area.</td>
</tr>
<tr>
<td>Hand rubs were not available at the point of care</td>
<td>Work with maintenance department to wall-mount the alcohol hand rubs at all patient care areas</td>
<td>The team leader ensured that all hand rubs were wall-mounted at all patient care areas</td>
</tr>
<tr>
<td>Hand rubs were likely to cause dryness of skin</td>
<td>Educate staff in using moisturising hand creams at interval times of the day, eg at tea or coffee time, lunch time, or at the end of the day</td>
<td>Moisturising creams were available at the staff room to encourage staff to moisturise their hands at rest times</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New hand rub products with moisturising components were available during the implementation phase</td>
</tr>
</tbody>
</table>
Figure 1: Pre-implementation audit results of hand hygiene adherence rates in the Radiation Therapy Centre

Figure 2: Pre- and post implementation audit results of hand hygiene adherence rates in the Radiation Therapy Centre
Hypoglycemia management of type 2 diabetic patients in a primary care setting: a best practice implementation project

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Abstract

Background
Hypoglycemia is one of the most frequently occurring complications in type 2 diabetes that can be potentially prevented. Severe hypoglycemia can result in suboptimal glycemic control due to poor adherence to treatment. Clinicians’ knowledge in risk factors and providing a systematic risk assessment plan is the best-available evidence for the management of hypoglycemia.

Aim
The purpose of this project is to improve current clinical practice in the management of hypoglycemic patients in the polyclinics using Joanna Briggs Institute (JBI) best practice recommendation.

Methods
A study was carried out in two local polyclinics from July to December 2012. A pre- and post audit was done to evaluate registered nurses (RNs) current clinical practices in hypoglycemia management using JBI Practical Applications of Clinical Evidence System (JBI-PACES) and Getting Research Into Practice (GRIP) module. Strategies to improve compliance included evidence-based educational programs for RNs and the placement of ‘hypo boxes’ in designated rooms. Nurses were provided guidance and support throughout the period.

Results
Sample sizes of 17 RNs were audited. There were overall improvements in all the criteria. Criteria 2 and 3 accounted for the largest improvement (94%) with regards to repeating blood glucose level in 10 minutes after a glucose drink was served to a hypoglycemic patient and the use of risk assessment plan in identifying patients at risk of hypoglycemia.

Conclusion
Implication for practice included role expansion of a primary care nurse in providing diabetes care, particularly in the area on hypoglycemia risk assessment. A supportive clinic management and collaboration contributed to the project’s success.

Keywords
diabetes, education, hypoglycaemia, management, risk assessment
Background

Diabetes mellitus (DM) is a major global health threat affecting both developed and developing countries. It is estimated that the world prevalence of diabetes will increase to 439 million (7.7%) adults by the year 2030, up from 285 million (6.4%) in 2010. The proportion of increase in adults with diabetes (aged 20 to 79 years) is projected to be greater in developing countries (69%) than in developed countries (20%) between 2010 and 2030.1

Similarly, the incidence of diabetes in Singapore is rising over the years. According to the National Registry of Diseases Office, the percentage of Singapore residents with diabetes between the age of 18 to 69 has gone up from 8.2% in year 2004 to 11.3% in year 2010.2 Nearly four in 10 diabetics are within the working age group (30 to 59 years).3 Diabetes is a chronic illness that requires regular long term medical care. A Singapore National Health Survey conducted in 2010 revealed that 32% of known diabetics had poorly controlled diabetes.4 More than half (66%) of diabetic patients sought treatment in the polyclinics.4 Of those whose blood sugar was poorly controlled, 28.6% were on drug treatment.3 The focus of diabetes care is on the prevention of long term complications that can result in disability and mortality. However, data on the prevalence and incidences of morbidity and mortality arising from acute complication of hypoglycemia is still lacking.5

It is widely known that hypoglycemia is one of the most frequent occurring complications5.6-9 in type 2 diabetes that is potentially preventable.5, 7-9 In severe cases it can lead to prolonged hospitalisation10 and can even be life threatening.5, 10, 11 The American Diabetes Association (ADA) workgroup on hypoglycemia11 classified hypoglycemia based on its severity:

1) Severe hypoglycemia: the person requires active administration of a carbohydrate source, glucagon, or other resuscitation measures by another person. Blood glucose may drop to less than 2.8 mmol/L.12
2) Documented symptomatic hypoglycemia: a plasma glucose measurement of ≤3.9 mmol/L, accompanied by typical hypoglycemia symptoms.
3) Asymptomatic hypoglycemia: plasma glucose concentration is ≤3.9 mmol/L without typical symptoms.

In National Healthcare Group Polyclinics (NHGP) hypoglycemia is defined as a blood glucose level that is less than 4 mmol/L.

Hypoglycemia is an unwanted treatment side effect and should not be dismissed10,13 as it can negatively impact on the quality of life of diabetic people.6,14,15 Symptomatic hypoglycemia resulting in cognitive impairment such as mental confusion, slurred speech, convulsion or coma may lead to anxiety and embarrassment.13,16 In the United Kingdom Prospective Diabetes Study (UKPDS), it was found that major hypoglycemic episodes did occur on a small proportion of patients regardless of the pharmacological therapy used.17 In Singapore, data on unplanned health service utilisation or hospitalisation due to hypoglycemic events amongst the elderly population is largely unknown.14 Such difficulty in assessing the prevalence of hypoglycemic incidences was likely due to underreporting, especially when not all patients have self-monitoring of blood glucose (SMBG) and self-defined hypoglycemia. The recognition of nocturnal hypoglycemic episodes were often sparse and imprecise, according to studies.5

Under the Singapore Clinical Guideline18 for diabetes management, hypoglycemia emergency management is not defined. Although NHGP institutional workflow is in place for hypoglycemia management, variation in practice is found amongst the nurses. For instance, RNs do not routinely assess for causes of hypoglycemia depending on the patient’s present condition. Hence the use of JBI best-available evidence for audit with regards to effective recognition and management of hypoglycemia18 and standardisation of practice is crucial. In NHGP, hypoglycemic patients are primarily managed by the care manager (CM) and treatment room RNs.

A pilot study was conducted in two polyclinics to evaluate the current clinical practices of hypoglycemia management. The goal is to streamline variation of practices in primary healthcare organisations.

Audit question

- To what extent are primary care nurses following best practice recommendations to manage hypoglycemia in type 2 diabetic patients?

Aim

- To improve hypoglycemia management workflow using best practice recommendations.
Objective

- To educate nurses on the importance of management of hypoglycemia.
- To implement a hypoglycemia risk assessment plan.

Method

The project timeline spanned over six months in three phases, from July to December 2012. The JBI-PACES program and GRIP19 module were used for data collection, and identifying of barriers for compliance.

Ethical considerations

Formal ethical approval was not required as patients were not directly involved. Confidentiality of patient data was strictly be adhered to and known only to the team members.

Phase 1: Preparation for audit

Identification of topic

This topic was selected for audit as it sought to standardise nursing management of patients with hypoglycemia.

Establishment of the audit team

This team was led by two senior staff nurses (a leader and co-leader) and two other RNs (who would take the role of the auditor) from their respective polyclinics. The RNs were selected on the accord of their assigned duties in the treatment room during the pre- and post audit periods. To ensure that the auditors complied with the audit criteria they were briefed on the use of the hypoglycemia audit tool. Any doubts were cleared before and during the audit period to ensure a smooth process.

Support for the audit team

Protected time was allocated for the team members to meet for discussion and training on the audit process using the hypoglycemia management audit tool.

Setting up JBI-PACES

The audit set up, sampling and data collection were entered into the JBI-PACES19 program.

Three of the four criteria were in line with the ADA position statement in standards of medical care diabetes 2012.

All four audit criteria from the JBI- PACES19 were utilised.

Criterion 1: Episodes of hypoglycemia and treatment administered is documented in the patient's record19

Compliance: There is a 100% documented evidence of hypoglycemia episodes and treatment administration in ENR.

Criterion 2: Repeated blood glucose level is documented at 10 minutes after initial treatment19 (Grade B)

Compliance: There is a 100% documented evidence of repeated blood glucose level at 10 minutes after initial treatment

Criterion 3: There is a risk assessment plan to identify patients with high risk of hypoglycemia19 (Grade B)

Compliance: There is 100% documented evidence in ENR that a risk assessment is done for persons with diabetes treated with insulin and/ or insulin secretagogues.

Criterion 4: There is documented evidence of daily blood glucose monitoring for persons with diabetes treated with insulin19 (Grade B)

Compliance: There is 100% documented evidence in ENR that the patient on insulin is recommended on daily blood glucose monitoring (if any).

Conduct baseline audit (2 April to 25 June 2012)

A baseline data of patient's fasting blood glucose (FBG) was retrieved from the NHGP diagnostics clinical laboratory with the approval of the Head of the polyclinic, followed by a nursing documentation audit of electronic nursing records (ENR) using a hypoglycemia management audit tool.

A total of 67 patients were found to have hypoglycemia requiring immediate treatment and 18 RNs attended to this group of patients. Each of the four criteria was audited to ascertain if the nursing documentation fulfilled the best practice recommendations. Any one of the sub criteria not fulfilled was considered compliance ‘not met’. If the patient’s condition was deemed unfit for complete nursing intervention, such as requiring transfer to hospital for further management, it would be classified as ‘not applicable’.
The audit and data entry into JBI-PACES was done over a week. All 18 RNs were audited due to the relatively small number. More than half (11 out of 18) of the RNs were treatment room nurses. The remaining were either care managers or health counselling nurse generally involved in care of patients with diabetes. An audit report was presented to the stakeholders via a PowerPoint presentation.

**Phase 2: Implementation of best practice**

**Group participation process for discussion of audit results**

A PowerPoint presentation of the baseline audit findings, audit criteria, observation of compliance and its significance at the primary care level was done with the nurse participants. The session allowed for open discussion and clarification on the audit criteria. Areas of good practice were encouraged and areas for improvement were brought up to enhance understanding of the need for evidence-based intervention. This discussion also served as a platform to brainstorm potential barriers to compliance.

**Use of GRIP to identify barriers**

The GRIP module was used to facilitate in problem identification and action planning. For instance, based on the audit findings, criteria 3 on risk assessment planning to identify patients with a high risk for hypoglycemia was poorly complied with. Potential barriers brainstormed included staff knowledge deficits, severity of patient’s condition, time factor and resource barriers, after which a strategic plan of action was implemented to assist RNs in managing hypoglycemic patients (Table 1).

One of the barriers pertaining to knowledge deficits was that although nurses generally knew the risk factors for hypoglycemia, the reasons for patients being at risk was not clear. To illustrate, the complexity of glucose counter regulation and hypoglycemic unawareness was unfamiliar to most RNs. Additional factors that contributed to the low level of compliance included focusing on treating hypoglycemic patients as the main priority in the treatment room and lacking knowledge in regards to offering carbohydrate food to patients after their hypoglycemia treatment. A GRIP action plan was used to serve as an interim report for the stakeholders to implement change.

**Strategies for improving compliance for each audit**

Education was a key component in preventing the recurrence of severe hypoglycemia in one local study. As a result, the team sought to empower RNs with the knowledge and skills required in managing hypoglycemia. An evidence-based education program was conducted for the 18 RNs on systematic nursing documentation in accordance with the hypoglycemia management audit tool. Other components included definition, hypoglycemia risk assessment, SMBG and the appreciation of pathophysiology of absolute or relative insulin excess and compromised glucose counter regulation. One to two sessions of the program were conducted in the respective clinics to ensure full attendance.

Good practices such as having a “hypo box” prominently placed in the care management and treatment room were adopted. These boxes contained a laminated copy of the institutional hypoglycemia workflow and the hypoglycemia management audit tool, dextrose powder sachets biscuits, cups, stirrers and mineral water. Coloured reminder cards (in the size of a name card) indicating the risk factors for hypoglycemia were placed with dextrose powder sachets to serve as a visual cue for the RNs.

**Implement the new practice (13 Aug to 12 Oct 2012)**

Our team assisted the change on the ground level to address any issues and concerns and provided guidance when an RN was attending to a hypoglycemic patient. More importantly, RNs were reinforced on the importance of identifying risk factors for hypoglycemia and to assist patients overcome recurring episodes by taking a concise history with respect to missed meals, vomiting, medication compliance, previous history of hypoglycemia, current low glycated hemoglobin (<6%) and comorbid condition.

Patient education on risk identification also served to empower diabetic patients in self-management as they encounter new challenges when advancement in treatment becomes available. As recommended by the ADA Standards of Medical Care in Diabetes 2012 position statement, patients ought to be mindful of situations in which they may put themselves at risk of hypoglycemia such as fasting for blood investigation or procedures, during or after intensive exercise or inappropriate use of glucose-lowering medication (timing/ dosage).

Feedback was welcomed and suggestions were taken into consideration for further evaluation. Positive reinforcement such as praising the good work done and tokens in the form of brightly coloured Post-it notepads were given out as a form of encouragement. Stakeholders were periodically updated on the progress.
Phase 3: Post implementation audit (16 Oct to 23 Nov 2012)

Before the post implementation audit, auditors were once again briefed and recapped on the audit criteria to ensure consistency. A post implementation audit (sample size n= 17) was carried out in the two polyclinics. The criteria were replicated from the phase 1 audit. The team tracked nursing documentation retrospectively from patients who required immediate hypoglycemia management. The audit was benchmarked against the best practice recommendations in JBI-PACES. A SPSS program was used for data entry and Fisher’s exact test was used to analyse pre- and post implementation audit results (Table 2).

Results

Baseline audit

The baseline audit results showed a high compliance for criteria 1. Ninety four per cent of the RNs (17 out of 18) documented the hypoglycemic episodes and treatment administered in patient’s records. None of the RNs documented repeat blood glucose at 10 minutes for criteria 2. Only one out of 18 RNs (6%) performed a risk assessment to identify patients with high risk of hypoglycemia (criteria 3). Lastly, only three of the 18 RNs (18%) documented a recommendation of daily blood glucose monitoring for diabetes patients treated with insulin (criteria 4) (Figure 1).

Post implementation audit

Figure 2 showed a comparison between pre- and post audit findings. A sample size (n= 17) was audited as one of the RNs was on no-pay leave during the audit period. A significant improvement was found in criteria 2, 3 and 4. In criteria 1, all of the nurses (100%) served glucose drinks followed by carbohydrate foods within 20 minutes (x²= 1.357, p= 1.000). In criteria 2, 16 RNs (94%) complied with repeating blood glucose level 10 minutes after the initial glucose treatment (x²= 40.656, p= .000). A significant improvement of 94% was found in criteria 3 in which all RNs performed risk assessment for hypoglycemia. (x²= 40.768, p=.000). Finally, criteria 4 accounted for a significant improvement of 76% (x²= 24.570, p=.000) with regards to documenting daily SMBG for diabetic patients treated with insulin.

Discussion

Hypoglycemia can largely be prevented with prudent assessment and evaluation done at the primary care level to eliminate the risk of admission to tertiary institution. Also, the clinical approach to minimising the risk of hypoglycemic episodes favours prevention over its treatment. It is the role of the clinician to identify risk factors and address the issues of hypoglycemia with patients during their clinic visits and provide patient education on self-monitoring of blood glucose and individualised glycemic goals.

The baseline audit finding was poor for criteria 2, most likely due to nurses following the NHGP workflow of ‘15-15 rule’ of giving 15 grams of glucose followed by rechecking blood glucose level after 15 minutes. Similarly, the audit result was poor for criteria 3. Documentation varied among RNs. A study by Maynard et al also showed comparable findings in relation to the issue of poor documentation. While most of the RNs recorded a chronological description of events of hypoglycemia treatment and treatment modality, only one of 18 RNs performed a full risk assessment for the hypoglycemic patient. Some of the responses from RNs included that their top priority was to treat the hypoglycemia while some patients were unfit for education. Other RNs felt that a detailed risk assessment was unnecessary and time consuming; and perhaps, there was a lack of competency in risk-assessing their patients. Such findings were not unexpected as a local study found that Singapore nurses are less likely than physicians to engage in a patient-healthcare provider partnership as a primary case manager directing patient care.

In our study significant improvement in compliance rates was found in criteria 2, 3 and 4. The success factor that could have contributed to the remarkable improvement included: 1) A structured educational program specifically targeting at prevention of hypoglycemia and the continuous effort of the RNs in providing evidence-based practice in their day-to-day care of diabetes patients. This is a potentially important finding, as early risk assessment for patients minimises future hypoglycemia occurrence, as is taking appropriate action as timely as possible. 2) Facilitate RNs when attending to hypoglycemic patients that ensures consistency in risk assessment. Learning takes place hence making nursing practice more meaningful and rewarding. A systematic review of several studies found that greater nurses’ involvement in diabetes management showed positive effects and that included patient education. 3) The introduction of a Hypo box readily available in the care management room and the attached coloured reminder cards prompted the RN to ask for the history leading to the hypoglycemic event whilst administering hypoglycemia treatment. Successful cases were also found in other studies.
The joint collaboration of the team members and the supportive clinic management led to the success of this project. Clearly a strong leadership who envision evidence-based practice as the future direction for healthcare laid a firm foundation for the novice to continue working towards NHGP’s vision, ie “To be the leading health promoting institution that helps advance family medicine and transform primary healthcare in Singapore”.

The area on daily SMBG for diabetes patients being treated with insulin were, by and large, dependent on the patient’s health literacy, motivation, skills and willingness. Nevertheless, only one of the audited patients was on insulin treatment. The International Diabetes Federation (IDF) 2012 Clinical guidelines task force global guideline for type 2 diabetes recommended SMBG for patients treated with insulin on an ongoing basis. Diabetic patients should always be encouraged to perform SMBG. And in order to improve patients’ adherence, healthcare providers must be able to make meaningful interpretations of the readings for his or her patients in therapeutic decision making.

The implementation of hypoglycemia risk assessment during their hypoglycemic state may not be the best time for patient education. The flurry of activity, ranging from glucose administration to repeating blood glucose testing, and the heightened level of anxiety could be potentially overwhelming. Perhaps with the introduction of evidence-based practice one should also tailor one’s teaching to take into consideration the patient’s present condition. This area should be revisited and reinforced by clinicians even when the patient is in a normoglycemia state.

Limitation
A relatively short time frame of six weeks for the post implementation audit does not allow evaluation of positive patient outcomes with the use of the hypoglycemia audit assessment tool. Generalisation of audit results should be done with caution with the small sample size. One recommendation would be to replicate the project in all NHG polyclinics to obtain a more representative sample. As there was no standardised format for documenting hypoglycemia in the ENR template, it was subjected to the auditors’ scrutiny and interpretation of the ENR records although attempts had been made to ensure their consistency.

Lesson learnt
From this project we learnt that effective time management, delegation of work and leadership skills are crucial in timely completion of work. We also learnt to make use of evidence-based resources from JBI and SPSS statistical program for data analysis.

Sustainment
A quarterly audit will be carried out by the team leader to ensure sustainability of best practice and rolled out in the remaining seven NHG Polyclinics.

Conclusion
The implication for practice may include role expansion of a primary care nurse in providing diabetes care in addition to care by the physician. With training and protocols RNs would be more confident to serve as a liaison between the patient and the physician in facilitating treatment adherence, for instance in hypoglycemia risk assessment. Patients who are identified to be at risk of hypoglycemia or have prior experience of hypoglycemia or hypoglycemia unawareness should have it documented in the significant history of electronic patient records. A detailed record of antecedent events that could have resulted in hypoglycemia ought to draw attention to clinicians and is an important consideration in the choice of approaches to diabetes treatment. Case discussion as part of continuous medical education (CME) would be a valuable platform for doctors and nurses to learn as an interdisciplinary effort is crucial in tackling hypoglycemia. The implications for the primary care institution would be an addition of a hypoglycemia risk assessment tool into the existing ENR template as a new clinical improvement initiative.

Acknowledgement
The team would like to thank the following: Ms Chen Yee Chui, Director of Nursing, National Healthcare Group Polyclinics, for her nomination of the team to participate in the evidenced based project; Dr Emily Ang, Deputy Director, National University Cancer Institute, National University Health System, on her guidance and passion in teaching the JBI Evidence-based Clinical Fellowship Program 2012; Senior Nurse Clinician Ms Chow Ying Leng, National University Cancer Institute, National University Health System, for her advice in JBI COnNECT program utilisation; Senior Nurse Manager Ms Yan Chau Chain, National Healthcare Group Polyclinics, for her supervision and mentorship in the write-up of this project; and lastly, RN Daana, of Hougang, and RN Diaz Rhea, of Ang Mo Kio Polyclinic, National Healthcare Group Polyclinics, for their role as auditors and for data collection.
References


Figure 1: Baseline audit

Criteria
Episode of hypoglycemia and treatment administered is documented in the patient's record.
Repeated blood glucose level is documented at 10 minutes after initial treatment
There is a risk assessment plan to identify patients with high risk of hypoglycemia
There is documented evidence of daily blood glucose monitoring for persons with diabetes treated with insulin.

Figure 2: Post implementation audit

Criteria
Episode of hypoglycemia and treatment administered is documented in the patient's record.
Repeated blood glucose level is documented at 10 minutes after initial treatment
There is a risk assessment plan to identify patients with high risk of hypoglycemia
There is documented evidence of daily blood glucose monitoring for persons with diabetes treated with insulin.
### Table 1

#### Problem identification and action planning

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Strategies</th>
<th>Resources</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge deficit</td>
<td>a. Conduct evidence-based educational program for nurses</td>
<td>i. Evidence-based journals</td>
<td>RN knowledge improved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. Room facilities</td>
<td>Conducive learning environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii. PowerPoint presentation</td>
<td>Facilitated learning</td>
</tr>
<tr>
<td></td>
<td>b. Design reminder cards indicating the risk assessment questions pasted on the dextrose powder sachets</td>
<td>i. Coloured cards</td>
<td>Improved compliance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. Risk assessment list</td>
<td>Ensure consistency in risk assessment</td>
</tr>
<tr>
<td>2. Lack of competency in risk assessment</td>
<td>a. Facilitate the RN during management of a hypoglycemic patient</td>
<td>i. Evidence-based journals</td>
<td>Ensure consistency in risk assessment, learning takes place as guidance is provided at point of care</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. Time allocation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii. Risk assessment list</td>
<td></td>
</tr>
<tr>
<td>3. Nurses did not offer carbohydrate food</td>
<td>a. Place hypo box in prominent place eg: CM room</td>
<td>i. Hypo box content includes: dextrose sachets, plain crackers, water, cups, stirers</td>
<td>Easily accessible and prompt administration of hypoglycemia treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. A plastic transparent container as Hypo box</td>
<td>Cost effectiveness</td>
</tr>
</tbody>
</table>

### Table 2

The number of samples for each criteria and degree of compliance pre and post implementation audit

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Pre audit</th>
<th>Post audit</th>
<th>X2</th>
<th>p- value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>#Y</td>
<td>%Y</td>
<td>n</td>
</tr>
<tr>
<td>1. Episodes of hypoglycemia and treatment administered is documented in the patient's record</td>
<td>18</td>
<td>17</td>
<td>94.4</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>1.358</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Repeated blood glucose level is documented at 10 minutes after initial treatment</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>40.656</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. There is a risk assessment plan to identify patients with high risk of hypoglycemia</td>
<td>18</td>
<td>1</td>
<td>5.6</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>40.768</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. There is documented evidence of daily blood glucose monitoring for persons with diabetes treated with insulin</td>
<td>18</td>
<td>3</td>
<td>16.7</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>24.570</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n: total number of staff audited; #Y: number of staff who complied with the criteria; %Y: percentage of staff who complied with criteria; x2: likelihood ratio; p- value: probability of a significant difference
Nutrition screening among patients with cancer in an acute care hospital: a best practice implementation project

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Abstract

Aims: This project sought to improve the nutrition screening practice of registered nurses in caring for adult patients with cancer.

Methods: This project used the pre- and post implementation audit strategy using the Joanna Briggs-Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) programs. The audit, feedback, and re-audit sequence was the strategy used to improve clinical practice. This project ran over three phases and five months from July to November 2011.

Results: According to the pre-implementation audit, only criteria 1 showed 100% compliance. Criteria 2 and 3 showed 96% and 46% compliance respectively. The team identified four barriers and developed action plans, which included a simplified nutrition screening tool, and empowerment of the nurses for dietitian referral. The post-implementation audit showed 100% compliance rate, achieved for all three criteria.

Conclusion: Overall, this project led to improvements in clinical practice based on current best practice evidence available. It resulted in improving knowledge and understanding on nutrition screening for adult patients with cancer.

Keywords: adult patients, cancer, malnutrition, nutrition, screening

Background

Cancer is the leading cause of death in Singapore. Deaths caused by cancer in 2009 accounted for 29.3% of 17,101 total deaths that year.1 Patients with cancer will develop a large number of physical symptoms. Malnutrition is one of the common symptoms caused by cancer.2 The prevalence of cancer patients with malnutrition can be up to 85% of patients.3 Cancer-associated malnutrition can result from local effects of a tumor such as mucositis induced by chemotherapy in head and neck cancer patients, and the host’s response to the tumor and anticancer therapies including chemotherapy and radiation therapy.4 The impact of malnutrition includes impairment of immune functions, performance status, muscle function, and quality of life.4 Patients with malnutrition respond poorly to chemotherapy.5 Furthermore, patients experience frequent and severe chemotherapy-induced toxicity that shortens their survival.3,4 In addition, healthcare-related costs increased significantly in patients with cancer-related malnutrition.5 Thus, early screening with an assessment tool helps nurses determine nutrition therapy for patients facing malnutrition risk.6,7

A screening tool refers to a questionnaire-format which contains risk factors.7 One of the barriers to adequate nutrition screening is the failure of healthcare professionals to assess nutrition status appropriately, which could be attributed to lack of knowledge.7,8 These challenges indicate the need for improved nutrition screening and management, which led the Joint Commission International (JCI) to consider nutrition status screening as one of the patient safety goals. It is now the JCI’s requirement that initial nutrition status screening is included along with routine screening of blood pressure, and pulse and respiratory rates for all patients on admission.8 All public hospitals in Singapore have been JCI accredited and it is obligatory to manage patients’ nutrition effectively.
The National University Hospital (NUH) is a 991-bed acute care, tertiary hospital, serving the population, mainly from the western district of Singapore. NUH is the first hospital in Singapore to gain JCI accreditation. It is also the nation’s only university hospital and is a main teaching hospital in Singapore. The National Cancer Institute of Singapore (NCIS) is one of the entities under the big umbrella of the National University Health System (NUHS). The NCIS provides a wide range of acute care for solid and liquid cancer patients often coupled with multiple co-morbidities. The results of the quarterly local chart review showed that registered nurses did not perform nutrition screening on admission in approximately 50% of patients. In addition, the doctors had not initiated a dietitian referral on admission when the nutrition score is 5 and above.

Aim
The aim of this project was to improve the nutrition screening practice of registered nurses caring for adult patients with cancer.

Audit question
To what extent are we engaging with best practice for nutrition screening for adult patients with cancer?

Objectives
- To provide education to registered nurses regarding the best available evidence on nutrition screening.
- To improve local practice of registered nurses in nutrition screening.
- To monitor audit compliance with best practice criteria for nutrition screening.

Method
This project used the pre- and post implementation audit strategy using the JBI-PACES and GRIP programs. JBI-PACES is an online tool that facilitates healthcare professionals to conduct efficient audit in a small or large healthcare setting via a process aimed towards change, with use of the best available evidence for better clinical practice.9 This project ran over three phases and five months, from July to November 2011.

Phase 1: Preparation for audit
Phase 1 involved identifying an audit topic, establishment of the project team, setting up of JBI-PACES, identifying audit criteria, identifying the setting and sample size and conducting a baseline audit.

Identifying an audit topic
The topic chosen for the project was ‘nutrition screening in patients with cancer’. The team chose this topic because the quarterly local chart review showed that registered nurses did not perform nutrition screening on admission in approximately 50% of patients. In addition, the doctors had not initiated a dietitian referral on admission when the nutrition score is 5 and above. It is also a JCI requirement that the healthcare professional must determine the nutritional status of patients on admission.9

Identify the setting and sample size
This project took place at NCIS, in one of the inpatient oncology wards comprising 24 beds. The sample size included all patients admitted to the ward due to the small bed size of the ward. The audit excluded non-malignant patients and transferred patients.

Establishment of the project team
The team identified key stakeholders that included two Nurse Managers, two Nurse Clinicians, and one Nurse Educator. The shareholders were chosen so as to obtain the management support and buy-in for the project. Two Senior Staff Nurses who participated in the Joanna Briggs Evidenced-based Clinical Fellowship Program served as leader and co-leader. Other members of the team included two Senior Staff Nurses and one Staff Nurse, selected based on their excellence in clinical practice, positive attitude, and their ability to reach and influence all nurses.

The team leaders introduced the project to the members, highlighting the importance of the topic, audit and compliance criteria, Gantt charts and how the audit would progress. The members and stakeholders contacted one another via email to ensure open communication.
Setting up JBI-PACES
The team leader formulated the details of the audit into the JBI-PACES. The details included adding new criteria, names of members performing the audit, allocating team roles, setting the audit type and completing the sample size.

Audit criteria
This project utilised three criteria from the JBI-PACES:

- **Criterion 1:** a validated screening tool is used to identify patients at risk of malnutrition
  Contextualised criteria 1: There is a nutrition screening tool incorporated into the nursing admission assessment form.
- **Criterion 2:** patients are screened upon admission using a validated screening tool
  Contextualised criteria 2: There is documented evidence that nutrition screening is done on admission.
- **Criterion 3:** Appropriate action plans are initiated when patients at risk of malnutrition are identified.
  Contextualised criteria 3: There is documented evidence that a dietician referral is made for patients whose nutrition screening score is 5 or more based on a 5-mins tool, and who score is 3 or more based on a 3-mins tool.

Conducting the baseline audit
The team members conducted a retrospective baseline audit in July 2011 over two weeks to determine to what extent current practice in the 24-bed ward complied with the best evidence on nutrition screening. All the team members helped in data collection. They went through the nutrition screening records of 24 patients with cancer, and entering the data manually into the audit tool. The team had requested the nurse manager to provide them with protected time of one hour, from 3pm to 4pm. The requested time was during overlapping shifts, which allowed the team to conduct the audit without compromising care of patients.

Phase 2: Implementation of best practice

Use of JBI-PACES and GRIP programs
The leader inputted the baseline audit data into the online JBI-PACES program, and data was generated in the form of a bar chart. The team used the GRIP program to identify gaps and barriers relating to compliance with nutrition screening. GRIP encompasses there components: situational analysis, action planning and action taking. In situational analysis, the team identified the gaps and barriers impacting compliance to nutrition screening. In action planning and action taking, the team identified measures to improve compliance with the audit criteria. The leader entered the identified gaps, barriers and measures into the GRIP program, and printed the data sheets to facilitate action planning. The leader presented the baseline audit results and GRIP data sheets to the stakeholders and team members.

Strategies for improving compliance for each audit
The team conducted an information-sharing session with the Staff Nurses, which included sharing of the pre-implementation audit results.

The team had identified four barriers based on feedback given from the nurses.

- **Barrier 1:** Nutrition screening tool deemed too complex
  Strategy: The dietician introduced a validated simplified version of the screening tool, a 3-MinNS nutrition screening tool (see Table 1). In addition, the dieticians conducted several rounds of road shows to brief the registered nurses on the use of the tool.

- **Barrier 2:** Nurses not empowered to make dietician referral.
  Strategy: Aurora is an online system used in NUH. This system allows doctors to order diagnostic tests and make allied healthcare referrals. Nurses are now empowered to refer patients to a dietician via Aurora allowing for timely referral.

- **Barrier 3:** Language barrier between staff nurses and patients.
  Strategy: Nurses verbalised that they were able to help their colleagues who had problems in communicating a particular language.

- **Barrier 4:** Mathematical error in totalling up nutrition score.
  Strategy: One-on-one engagement and constant reinforcement with the individual registered nurse.
Phase 3: Post implementation audit
The team carried out the post implementation audit at the end of phase 2. The method used for this audit was similar to that used for the baseline audit. The leader presented the results to the stakeholders and team members.

Ethical consideration
This project maintained patients' and staff members' confidentiality and anonymity throughout the project.

Results

Pre-implementation audit
Figure 1 shows the pre-implementation audit results. Criterion 1 and 2 achieved 100% and 96% respectively, an indication of excellent compliance to best practice. Criterion 3 achieved 46%, indicating poor compliance to Best Practice.

Post implementation audit
All three criteria achieved 100% compliance (figure 2). Criterion 3 showed a significant improvement from 46% to 100% ($x^2=22.967; p=0.000$).

Discussion
Overall, this project resulted in improvements in clinical practice based on current evidence. It also resulted in increased awareness and knowledge on nutrition screening for adult patients with cancer. Criterion 1 focused on validating the screening tool used to identify patients at risk of malnutrition, and achieved 100% for pre- and post implementation. Both the 5-MINS and 3-MINS nutrition screening tools are validated tools, and are easy to use.

Criterion 2 was on nutrition screening for patients with cancer, and it achieved 96% for baseline and 100% for post-implementation audits. The team and stakeholders realised that the practice in screening the patients with malnutrition was consistent. The nurses shared that the consistent results were due to their compliance to the hospital's clinical practice standards which their clinical preceptors or senior nurses had inculcated in them. Hence, nursing mentors played a pivotal role in transforming a novice nurse into an expert nurse in the clinical setting. Furthermore, most of the nurses found the nutrition screening tool easy to use and instructions, straightforward. Nurses also shared that because there were many activities going on in a shift, nursing documentation needed to be concise and easy to follow.

Criterion 3 focused on referral to a dietician for patients at risk of malnutrition by the nurses. This criterion achieved 100% in the post implementation audit, a significant improvement of 54% in the compliance rate. The initiative taken by the nurses to make dietitian referrals contributed to the marked improvement in the result of criteria 1.

Limitations
The limitations of this project were the small sample size and the short timeline of three months. Furthermore, the efforts would need to be ongoing as the team members are the clinical nurses who have direct patient care at the clinical setting. Members would need to continuously monitor procedures to ensure ongoing compliance.

Success factors
Three factors contributed to the success of this project. The first was the initiative taken by the nurses to make dietitian referrals for patients whose nutritional score was 3 and above. The second was the introduction of a simple nutrition screening tool. The third was adequate human resources, good teamwork, and support from the Nurse Manager, Nurse Clinicians and Nurse Educator. In addition, everyone in the ward embraced a culture of change.

Lesson learnt
As the nurses participating in the evidence-utilisation project were novices, they felt that this project gave the opportunity to enhance their leadership skills. In addition, the team also discovered that as most of nurses in the ward were Generation Y, showing appreciation, a team-based approach, and the need for adequate supervision was of high importance. Lastly, commitment and passion from the team members were essential factors for the success of any project.
Conclusion
This project used the pre- and post audit strategy to translate evidence into practice. It demonstrated that implementation of best practice is not only possible in a busy oncology, it also led to a remarkable improvement in the nutrition screening of patients with cancer. In addition, the use of an easy screening tool requiring little effort had resulted in increased compliance rates.

Acknowledgement
The project team would like to express our sincere thanks to Dr Emily Ang and Senior Nurse Clinician Chow Ying Leng for their guidance throughout the project. The team would also like to thank Senior Nurse Manager Ong Hwee Sen, Senior Nurse Clinician Lee Lay Hoon, Nurse Clinician Seri Sastika, and Nurse Manager Irene Lee for their support in this project; and senior Staff Nurse Zhao Xiaohong, Senior Staff Nurse Lim Bee Kuan and Staff Nurse Ngo Yuting for collecting the data.

References
7. Tsai AC, Hsu WC, Chan SC, Chang TL. Usefulness of the mini nutritional assessment in predicting the nutritional status of patients with liver cancer in Taiwan, Nutrition & Cancer. 2011; 63(3): 334-341.
Table 1: 3-MinNS nutrition screening tool

<table>
<thead>
<tr>
<th>Score</th>
<th>Unintentional Weight Loss (past 6 months)</th>
<th>Nutritional Intake (past 1 week)</th>
<th>Muscle Wastage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Muscle From Temple</td>
<td>Clavicle Bone</td>
</tr>
<tr>
<td>3</td>
<td>□ &gt;7 kg</td>
<td>□ Starvation or&lt;br&gt;~1/4 of usual portion/ meal&lt;br&gt;Tube Feeding&lt;br&gt;&lt;1 L/day (1 kcal/ml feed)&lt;1000 kcal/day</td>
<td>□ Hollowing, Depression of Temple Muscle</td>
</tr>
<tr>
<td>2</td>
<td>□ &gt;3 to 7 kg, Yes, unsure</td>
<td>□ 1/4 – &lt;1/2 of usual portion/ meal with no oral supplement&lt;br&gt;Tube Feeding&lt;br&gt;1 – 1.25 L/day (1 kcal/ml feed)&lt;1000 kcal/day</td>
<td>□ Slight Depression of Temple Muscle</td>
</tr>
<tr>
<td>1</td>
<td>□ 1 to 3 kg, Don’t know</td>
<td>□ 1/2 – &lt;3/4 of usual portion/ meal or 1/4 – &lt;1/2 of usual portion/ meal with oral supplement&lt;br&gt;Tube Feeding&lt;br&gt;1 – 1.25 L/day (1 kcal/ml feed)&lt;1000 kcal/day</td>
<td></td>
</tr>
</tbody>
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Figure 1: Baseline audit result
Figure 2: Post implementation audit results

Figure 3: Fisher's exact test

<table>
<thead>
<tr>
<th>Cases</th>
<th>Pre-audit</th>
<th>Post audit</th>
<th>( X^2 )</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>#Y</td>
<td>%Y</td>
<td>N</td>
</tr>
<tr>
<td>Status * Criteria1</td>
<td>24</td>
<td>24</td>
<td>100%</td>
<td>24</td>
</tr>
<tr>
<td>Status * Criteria2</td>
<td>24</td>
<td>23</td>
<td>96%</td>
<td>24</td>
</tr>
<tr>
<td>Status * Criteria3</td>
<td>24</td>
<td>11</td>
<td>46%</td>
<td>24</td>
</tr>
</tbody>
</table>

N, the total number audited; #Y, number complied with criteria; P, probability of a significant difference.
Maintaining patency of central venous access devices by registered nurses in an acute ambulatory setting: an evidence-utilisation project

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Abstract

Aims:
The aim of the project was to maintain the patency of Central Venous Access Devices.

Method:
This project utilised the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) programs to facilitate a process of change using an audit, feedback and re-audit cycle as a strategy to improve clinical practice. The team conducted the project in three phases and took approximately five months (July 2011 to the third week of November 2011) to complete the project. It involved a sample size of 29 Registered nurses.

Results:
The compliance rate for both criteria increased, demonstrating a positive improvement in compliance to best practice. The pulsated flushing technique had improved from 25% (baseline) to 93% (post implementation). This showed a statistically significant improvement of 68% ($\chi^2=29.375$, $p=0.000$). The second criterion, the use of sterile normal saline to flush and lock catheter, had improved from 68% in the baseline audit to 100% in the post implementation audit ($\chi^2=14.215$, $p=0.005$).

Conclusion:
This project utilised the process of audit, feedback and re-audit cycle as a strategy to improve clinical practice. It demonstrated the feasibility of translating evidence-based practice into the clinical setting, with remarkable improvement in maintaining patency of Central Venous Access Devices (CVADs) for patient with cancer. Finally, it is evidence that the commitment and enthusiasm of team members and all the registered nurses in maintaining patency of CVADs were crucial factors for the success of the project. The support and assistance provided by stakeholders were essential in the sustainment of the project.

Keywords:
ambulatory setting, central venous access device, normal saline, push pause technique, registered nurse

Background

CVADs are small, flexible tubes inserted directly or in directly into the superior vena cava of patients who require frequent access to the bloodstream without the need for multiple venepuncture. These devices are referred to as venous access ports or catheters.1,9

CVADs have become invaluable for patients with cancer who require long-term venous access and especially those who have poor peripheral access. In cancer treatment, the healthcare professionals use CVADs to facilitate the intravenous administration of chemotherapy, nutrient admixtures, blood products, antibiotic therapy and blood sampling. The two common types of CVADs for patients that require long-term treatment are the central venous catheter or the implantable subcutaneous port systems.2

There are complications associated with CVADs such as site infection, catheter occlusion, dislodgment and Twiddler's syndrome, catheter migration, catheter pinch-off syndrome, vessel thrombosis, damaged catheter, superior vena cava syndrome, and skin erosion. Among these complications, catheter occlusion accounts for up to 36% of device complications associated with CVADs.3
Maintaining patency of CVADs is the primary goal of nurses working in the oncology setting. One of the primary interventions to prevent catheter occlusion is by flushing the catheter adequately after each use. Flushing the CVADs with normal saline (NS) heparinized saline (HS) or a combination of both using a push pause technique has the potential to decrease catheter occlusion.

Approximately 13% of patients receiving treatment at the ambulatory Cancer Centre in National University Cancer Institute Singapore have CVADs. There have been an increasing number of catheter occlusions, which may lead to catheters removal after several failed attempts of de-clotting the devices. Dysfunctional CVADs need to be replaced with new ones, which sometimes lead to patients' dissatisfaction with the services provided by the hospital.

Replacing a dysfunctional CVAD is an expensive procedure because catheter replacement requires a new venous access site, surgery or radiology consultation charges, and sedation. In addition to the financial costs incurred by the patients, catheter replacement can pose a clinical risk and affect patients' quality of life. The cost of replacing a device ranged from SGD$1500 to $2000 depending on the type of CVAD.

Hence, nurses working in the ambulatory Cancer Centre at National University Cancer Institute Singapore (NCIS) must take appropriate steps to prevent thrombotic occlusion in order to prevent delay in treatment and compromise patient safety. Thus, the purpose of this project is to improve the patency of the CVADs.

**Audit question**

To what extent are Registered nurses engaged in the best practice in CVADs flushing?

**Aims/objectives**

The aim of this project was to maintain the patency of CVADs. The specific objectives were:

- To educate registered nurses on the importance of using the correct pulsation flushing technique
- To demonstrate to registered nurses the correct pulsation flushing technique
- To monitor the compliance of best practice.

**Methods**

This project utilised the JBI-PACES and GRIP programs to facilitate a process of change using an audit, feedback and re-audit cycle as a strategy to improve clinical practice. The team conducted the project in three phases and took approximately five months period (July 2011 to the third week of November 2011) to complete the project as shown in the Gantt chart (refer Appendix I).

**Ethical consideration**

This project was a quality improvement project. There is no requirement to seek for ethical approval. No personal information of the registered nurses was collected in this project and the team adhered to principles of confidentiality and anonymity throughout the project.

**Phase 1: Preparation for the audit**

The first phase comprised activities, which include identification of topic, establishment of the project team, identification of setting and sample. The team utilised the JBI-PACES and GRIP programs in the selection of audit criteria, conducting baseline and post audit and identifying barriers and action.

**Identification of topic**

The topic of this project was maintaining patency of CVADs by registered nurses in an acute ambulatory setting. The team selected this topic because the department encountered a high incidence rate of CVAD occlusions in the recent months. And maintaining the patency of CVADs is the primary goal of the department with patients having CVADs.

**Establishment of the project team**

There were three members in the project team. The nurse clinician who was the team leader had two senior staff nurses to assist her in conducting the project. One of the senior staff nurses was the co-leader and both the team leader and co-leader attended the Joanna Briggs Evidenced-based Clinical Fellowship Program sponsored by the department. The team leader selected another senior staff nurse, who worked in the same department with the team, as she was able to embrace change with a positive attitude. The team leader explained the role and responsibilities to the team member. All three members were the audit team in the project.
The team leader conducted meetings fortnightly to brief stakeholders and members on the details of the project, highlighting the importance of the project, the audit criteria and compliance, the process of the audit and timeline of the project. The briefing was to establish open communication with all stakeholders with the goal of having their support in providing budgeted time for the team members in conducting the project.

**Identification of setting and sample size**
This project took place at the Cancer Centre, an ambulatory care setting at National University Cancer Institute, Singapore (NCIS). The sample size was the entire population of 29 registered nurses working in the treatment area of the ambulatory care setting. The team excluded other registered nurses, as they did not provide direct care to patients with CVADs.

**Selection of audit criteria using JBI-PACES**
The team searched through JBI-PACES and utilised two audit criteria from the program to design the audit tools before conducting the baseline audit.

The two criteria were:
1. A pulsated flushing technique is used to maintain positive pressure when the catheter is flushed.
2. Sterile normal saline for injection is used to flush and lock catheter lumens that are in frequent use.

**Designing of audit tools**
The senior nurse clinician of the department validated the contents of audit tools before the team leader educated the team on the pulsated flushing technique and the use of audit tools. The team amended the audit tools (refer to Appendix II) after piloting the process of the audit on three newly-joined registered nurses.

**Conducting the baseline audit**
All three members of the team conducted the baseline audit during the period from 18 July 2011 to 29 July 2011. Each member of the team conducted the audit in the assigned treatment area, delegated by the team leader. The audit team observed the Registered nurses performing the flushing of CVADs particularly on the pulsated flushing technique, on patients who required CVADs flushing.

The audit team recorded the baseline results on the printed designed audit tools and keyed them into JBI-PACES upon completion of the baseline audit. The team leader shared the results of the audit with the stakeholders, team members and the registered nurses in the weekly in-service sessions. The team leader and the co-leader facilitated the session using GRIP program to identify the barriers and action plans with the registered nurses.

**GRIP strategies**
The team identified two barriers and developed action plans and strategies in the criteria related to the pulsated flushing technique. The first barrier was the use of the wrong pulsated flushing technique by Registered nurses in flushing the CVADs after checking the return backflow and before connection of continuous infusion to the CVADs. The second barrier was the knowledge deficit of the registered nurses on the use of additional saline to flush the CVAD lumens before flushing the heparin lock. The RNs did not use additional saline in a syringe to flush the catheter lumen when they discontinued the saline infusion connected to the CVAD.

The following strategies were developed:

For criterion 1:
- Re-demonstrate the correct pulsated flushing technique and encourage daily practice
- Mannequins with CVADs were available for use for practice purposes
- Reinforce and create awareness on the importance of correct pulsated flushing techniques.

For criterion 2:
- Conduct sharing sessions and re-educate the registered nurses to use additional saline in a syringe to flush catheter lumens before heparin lock
- Reinforce to each individual staff the importance of using saline in syringes to flush before administering a heparin lock to the catheter lumen.

**Phase 2: Implementation of best practice**
The team implemented the best practice over an eight-week period from 29 August 2011 to 21 October 2011. The team leader re-educated the registered nurses from the first to the third week of August 2011. During the in-service training, the team leader demonstrated to the Registered nurses the correct pulsated flushing technique using mannequins with CVADs attached. The registered nurses were to perform a repeat demonstration on the mannequins after the demonstration from the team leader.
The registered nurses practised this daily under the supervision of the audit team until mastery of skill was achieved. During the implementation phase, the team members were in the treatment area daily on weekdays over a period of three weeks to observe the pulsed flushing technique and simultaneously provide support and answering queries from the Registered nurses.

**Phase 3: Post implementation audit**

In this phase, the team leader briefed the audit team on the audit process. The audit team conducted the post implementation audit over a period of two weeks from 7 November 2011 to 18 November 2011. The audit team utilised the same baseline audit methodology to conduct the post implementation audit.

The team leader collated and analysed the baseline and post implementation results using the Statistical Package for the Social Sciences (SPSS) program.

**Results**

**Baseline audit result**

Figure 1 shows the baseline audit results. The results reported that seven out of 29 registered nurses (25%) performed the correct pulsed flushing technique (criterion 1) and 19 out of the 29 registered nurses (68%) used sterile normal saline to flush before administering the heparin lock (criterion 2).

**Post implementation audit result**

Figure 2 shows the results of both the baseline and post implementation audits. The compliance rate for both criteria increased as demonstrated by positive improvement in compliance to best practice. The pulsed flushing technique compliance rate had improved from 25% (baseline) to 93% (post implementation). This shows a statistically-significant improvement of 68% ($\chi^2=29.375$, $p=0.000$) as illustrated in Table 1. The compliance rate for the second criterion, the use of sterile normal saline to flush and lock catheter, improved from 68% in the baseline audit to 100% the post implementation audit ($\chi^2=14.215$, $p=0.005$).

**Discussion**

From the results, the project demonstrated success in achieving positive outcomes in the implementation of best practice for maintenance patency for CVADs. The project highlighted that reinforcement and repeat demonstration is the key educational strategy to educate registered nurses in the maintenance of patency in CVADs.

Both criteria showed an increase in compliance rates. For criterion 1, there was a significant improvement of 68% in the Registered nurses using the pulsed flushing technique in maintaining patency of CVADs. For criterion 2, there was a modest improvement of 32% relating to the use of sterile normal saline to flush and lock after each use. There were two interventions which contributed to the improvement of the compliance rate. The first intervention was the discussion cum education sessions facilitated by the audit team. The audit team conducted six sessions to achieve full attendance of registered nurses, and utilised this education session to assess the knowledge and skills of the registered nurses. In addition, the audit team taught the registered nurses on the correct pulsation flushing technique through engaging them in social interaction and building their confidence in a positive manner. The second intervention was the personalised training provided to the individual registered nurses by the team leader. The team leader demonstrated and supervised individual registered nurses until mastery of skill in the pulsed flushing technique was achieved. According to registered nurses’ feedback, individual training and learning benefitted them in mastery of the skill. However, educating them individually was time consuming and challenging as it needed to fit in with their working schedule.

**Challenges encountered during the audit phase**

During the baseline audit and post implementation phases, the audit team encountered difficulties in finding the opportunity to observe the registered nurses performing the flushing of CVADs. The majority of patients with CVADs received the treatment in the early hours of the day in the treatment area. Therefore some of the registered nurses working in the late shift were unable to perform direct care to this group of patients. The team leader had to work with the nurse manager of the department to re-schedule the working hours of these registered nurses so that the audit team could audit them when they were performing the flushing of the CVADs.

**Success factors**

The success of this project was attributable to team members working collaboratively to overcome challenges and completing the project with a positive attitude. However, the effort, commitment and enthusiasm of team members and stakeholders were equally as valuable.
Sustaining the outcomes

Adopting evidence-based practices is critical and crucial for maintenance patency for CVADs. However, sustaining the compliance to best practice is a tough challenge as it is an ongoing process. The team plans to delegate responsibility to two competent registered nurses and involve them in ensuring other registered nurses follow best practice. The team also plans to train two senior registered nurses in providing teaching and guidance to junior registered nurses to maintain patency of CVADs. For ongoing monitoring, the team will continue to conduct audits quarterly, followed by subsequent six monthly audits.

Limitation

The limitation of this project was the short time frame for implementation and the small sample size.

Conclusion

This project utilised the process of audit, feedback and re-audit cycle as a strategy to improve clinical practice. It demonstrated the feasibility of translating evidence-based practice into the clinical setting, with remarkable improvement in maintaining patency of CVADs for patients with cancer. Finally, it is evidence that the commitment and enthusiasm of team members and all the registered nurses in maintaining patency of CVADs were crucial factors for the success of the project. The support and assistance provided by the stakeholders were essential in the sustainment of the project.

Acknowledgments

The authors would like to acknowledge Dr Emily Ang and Senior Nurse Clinician Chow Ying Leng for their advice and guidance on the Evidence-Based Clinical Fellowship Program. In addition, the authors would like to thank Senior Staff Nurse Tan Yi Siew who contributed as team member, and Senior Nurse Manager Zarinah Hairom and the Nurse Manager who were stakeholders of this project.

References

Appendix I: Gantt chart

Appendix II: Audit tool

<table>
<thead>
<tr>
<th>S/N</th>
<th>JBI Criteria</th>
<th>Observation</th>
<th>Validate documentation</th>
<th>Met</th>
<th>Not Met</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sterile normal saline for injection is used to flush and lock catheter lumens that are in frequent use</td>
<td>Procedure: CVADs flushing before or after chemotherapy or for CVADs flushing. The RN prepare and use 10ml syringes filled with at least 5mls of sterile normal saline (N/S)</td>
<td>Check Nursing Notes for documentation of CVAD flushing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A pulsed flushing technique by maintaining positive pressure is implemented when catheter is flushed</td>
<td>Observe the RN during the flushing of CVAD • A brief push-pause technique (1ml at a time) • Creating a positive pressure while flushing</td>
<td>Check Nursing Notes for the documentation of CVAD flushing</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>
Table 1: Pre- and post audit compliance results

<table>
<thead>
<tr>
<th>Criteria</th>
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<th>Post-audit</th>
<th>χ²</th>
<th>p-value</th>
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<tr>
<td></td>
<td>n</td>
<td>Y</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>1 A pulsed flushing technique by maintaining positive pressure is implemented when catheter is flushed</td>
<td>29</td>
<td>7</td>
<td>25</td>
<td>29</td>
</tr>
<tr>
<td>2 Sterile normal saline for injection is used to flush and lock catheter lumens that are in frequent used</td>
<td>29</td>
<td>19</td>
<td>68</td>
<td>29</td>
</tr>
</tbody>
</table>

(*n* is the number of RNs audited, ‘*Y*’ is the number of RN compliance, ‘%Y’ is the percentage compliance, ‘χ²’ is degree of relationship between the two variables, ‘p’ is statistical significance where p<0.05)

Figure 1: Baseline result

Figure 2: Baseline and post implementation audit results
Using proactive nursing rounds to reduce the use of call lights and improve patient satisfaction in an acute oncology unit

Chua Chue Teng
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Abstract

Background:
Call light is a patient’s lifeline, especially in a single room unit, because it is the only way a patient can communicate his/her needs to the nurses. However, frequent call lights can also impose inconsiderable demands on nurses, disrupt nurses’ workflow and cause burnout in nurses.

Objectives:
The objectives of the project are to use nursing rounds at stipulated timings to reduce the use of call lights and fall rates, and to increase patient satisfaction and promote quality improvement initiatives within the unit.

Methods:
This project utilised a pre- and post implementation audit methodology adopted from the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) programs. The team used three audit criteria recommended by JBI-PACES to conduct audits on 19 nurses who worked in an acute oncology unit in Singapore from February to June 2012.

Results:
The post implementation results showed that the unit did not achieve 100% compliance in nursing rounds. However, there is a twofold increase in compliance in all three criteria. Nursing rounds has also shown to reduce the use of call lights, reduce fall rates and increase patient satisfaction in this study.

Conclusion:
Nursing rounds with a protocol that includes specific nursing actions increases patient satisfaction and frequency of call light use. Continual effort should be pursued to achieve 100% in nursing round compliance through more cycles of GRIP and audits. The nursing round team will use more effective leadership strategies to ensure success of the project.

Keywords:
call lights, nursing rounds, patient satisfaction, patient safety, hourly rounding

Background
Call lights are a patient’s lifeline, especially in a single room unit, because it is the only way a patient can communicate his/her needs to the nurses.¹ However, frequent call lights can also impose inconsiderable demands on nurses, disrupt nurses’ workflow and cause burnout in nurses.²³⁴ There is a large body of evidence indicating that nurse burnout has significant correlation to many undesirable outcomes such as patient safety, risk of death, failure to rescue, patient satisfaction and retention rate.⁶ With reduced call lights, the ward becomes calmer and less chaotic. Such an environment is more conducive to work in and to be cared in.⁶ It can also alleviate pressure on nurses as constant demands in answering call lights inevitably disrupts nurses’ ability to perform their duties.¹⁷ Sometimes, nurses are occupied in responding to call lights and there is consequently a delay in responding to other patients’ call lights. This has resulted in patient frustration, dissatisfaction and even potential threats to patients’ safety such as falls.⁵⁷
Nursing rounds is an identified strategy to address frequent call light use.\textsuperscript{2,3,4} It involves intentional checks on patients at set intervals to ensure all patients receive attention on a regular basis.\textsuperscript{4} Hospitalised patients feel anxious and uncertain regarding availability of nurses to attend to their needs.\textsuperscript{4} Nursing rounds have proven to address these concerns by incorporating nurses’ physical presence with quality attentiveness and awareness of patients’ needs.\textsuperscript{3} When nurses are consistent with their rounds and meet patients’ needs, nurses can manage patients’ expectations, reduce fall rate and reduce call lights use.\textsuperscript{2}

There is an increasing awareness of the importance of patients’ experiences as a fundamental aspect of quality of healthcare.\textsuperscript{1} When nurses react to patients’ needs only when the patients use call lights, patients perceive such nursing care as reactive and hence decrease their satisfaction towards the general nursing care.\textsuperscript{2,4,6,4,7} Implementation of nursing rounds consistently allows patients to trust the reliable system and nurses in delivering satisfactory care.\textsuperscript{6} While nurses take time to perform nursing rounds, the process actually gives time back to the nurses because of reduced call light use.\textsuperscript{6} The give-back time allows nurses to organise their workflow and results in nurses doing more meaningful, completed work.

There is strong evidence indicating systematic nursing rounds coupled with specific nursing actions have several positive effects in patient outcomes. A clinical evidence review in 2008 reported that attending to patients proactively during nursing rounds resulted in reduced fall rates, decreased nurses’ fatigue, lesser non-urgent call light use and increased patient satisfaction.\textsuperscript{2} The review uses 11 studies where the majority of the studies incorporates acceptable and useful evidence.

In an acute oncology setting that houses 16 single rooms in an acute public hospital in Singapore, data on the reasons for call light use were collected for three months prior to the project (Appendix 1). Sixty-three percent of call lights were requested for basic needs such as toileting, comfort and food, and 28% were related to matters regarding medications. Nurses often have to put aside their existing tasks to attend to call lights. When they have completed answering the call lights, they may move on to other tasks and leave the previous task uncompleted. There are many consequences to uncompleted tasks. For example, patients become frustrated when they are not fully attended to or incomplete documentation results in missing pertinent information about care. A pilot study to implement nursing rounds at stipulated intervals whereby there are no routine nursing activities in the patients’ rooms is to be initiated in the unit. The nurses have to perform specific nursing actions in the patients’ rooms to address the top five reasons for the use of call lights. These are toileting needs, matters concerning medications, providing comfort and assisting in food matters. As it is a pilot study, the project’s focus is on nursing actions that address the top five reasons for call light use.

**Objectives**

The objectives of the project were to:

- ensure all nurses perform nursing rounds at stipulated timings
- improve patient satisfaction
- reduce the number of top four call light uses. These are toileting needs, matters concerning medications, providing comfort and assisting in food
- reduce patients’ fall rate
- promote quality improvement initiatives within the unit.

**Methods**

This project utilised a pre- and post implementation audit methodology adopted from the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) programs. The team used three audit criteria recommended by JBI-PACES to conduct audits on 19 registered nurses (RNs) and enrolled nurses (ENs) working in an acute oncology unit in an acute public hospital. The audit was conducted from February to June 2012.
Ethical considerations
The quality improvement project would not compromise patients’ safety and confidentiality at any juncture, therefore formal approval from any ethics committee was not required.

Phase 1: Baseline audit period (14 February to 31 March)
Identifying the topic
The topic selected was using proactive nursing rounds to reduce call light use and improve patient satisfaction in an acute oncology unit.

Establishing the team
The project team comprised two RNs of whom one was the project leader and the other was a senior staff nurse (SSN). The project leader briefed all the stakeholders on the purpose, details, importance and timeline of the project, and expected compliance with audit criteria. The role of the SSN was to assist in developing nursing rounds documentation materials and explaining the purpose and implementation details of the project to the nurses during general report sessions, and clarifying any doubts expressed by nurses.

Identifying the audit criteria
The team identified the three criteria recommended by JBI evidence summaries on nursing rounds.

The audit criteria were:
1. Hourly nursing rounds are conducted at a stipulated time during awake hours (Grade B).
2. Hourly or 2 hourly nursing rounds are conducted during sleeping hours (Grade B).
3. A protocol is used by nurses when conducting rounds (Grade B).

Conducting the pre-implementation audit
Both the project leader and the SSN performed baseline audits by conducting direct observation on all 19 RNs and ENs using nursing rounds audit tool (Appendix 2). The leader was in charge of keying in baseline data into JBI-PACES.

Phase 2: Implementation period (1 Apr to 22 June)
Based on the pre-implementation audit results, the compliance rates for all three criteria were low. The compliance rates for criterion 1 to 3 were 5%, 16% and 21% respectively (Appendix 3). The team presented the low compliance findings, and explained the implementation and benefits of nursing rounds to individual nurses. Each individual engagement took place for about 15 minutes. During the individual engagement sessions, the team utilised GRIP to facilitate the nurses in brainstorming barriers to performing nursing rounds. Using critical reflection, the nurses developed strategies to target each barrier in order to achieve better compliance rates. The team supported the strategies by getting resources for nursing actions to overcome barriers. The team recorded the barriers, strategies and resources into GRIP (Appendix 4).

After individual engagements were completed, nursing rounds were implemented which lasted for eleven weeks. During the period, all nurses were being audited on their nursing rounds through direct observation. The nurses also had to record call light use in call light record sheets placed at the door of each room.

There was no Hawthorne effect as the team did not reveal to the nurses that they were being audited on nursing rounds and specific nursing activities.

Phase 3: Post implementation audit (22 to 29 June)
The team met to enter post implementation data into JBI-PACES as per the pre-implementation audit. There was no change in topic, criteria, sample size or location for the post implementation audit. The team then evaluated the pre- and post implementation audit results.
Results

The post implementation audit results showed that compliance rates improved for all three audit criteria (Appendix 5). For criterion 1, there was 27% increase in the compliance rate in nurses performing hourly nursing rounds between 9am to 11am and 3pm to 7pm. For criterion 2, there was 19% increase in the compliance rate in nurses performing two-hourly nursing rounds during non-wake hours. For criterion 3, there was 26% increase in the compliance rate in nurses providing specific nursing activities namely seeing to toileting needs, matters regarding medications, providing comfort and offering food to patients.

The number of times call lights were used during the nursing rounds implementation was reduced by 31% (Appendix VI). Call lights for toileting needs were reduced by 31%, matters relating to medications were reduced by 37%, providing comfort was reduced by 49% and offering food increased by 1%.

Discussion

Results analysis

The objectives of nursing rounds implementation were mainly met as data showed the reduced number of times call lights were used, lower fall rates and increased patient satisfaction. The objective of involving nurses in quality improvement initiative was also met because GRIP was implemented via individual engagement. The only objective that was not met during the three-month phase of implementation was the achievement of 100% compliance rates in all audit criteria.

The pre-audit compliance rate is poor to start with. It is unlikely that within a short span of three months, nurses are able to incorporate a new practice into their daily routine. This is because nurses are constantly keeping pace with frequent changes in the unit such as new policies, knowledge and technologies. Also, if practice has never been a social or behavioural norm in the unit, to achieve 100% compliance within a short space of time would be theoretically not feasible. However, the compliance rate has increased twofold for each criterion. It is a strong indication that change is in good progress. The results strongly suggest that if given more time and with more leadership, the nurses’ mindsets and unit’s culture on nursing rounds will see a positive change.

The overall quality of care for patients has increased since the introduction of nursing rounds in the unit. Fall rates have reduced during the same period in the month, between implementation months, and in the same period the year before. The unit has not been able to reduce fall rates effectively with various strategies in the past few years. Nursing rounds may be the right approach to reducing falls in the unit.

Patient satisfaction with regards to overall experience has also increased from 66% to 100% during the post implementation period based on a quarterly patient survey. More insights as to whether nursing rounds has contributed to an increased overall patient experience can be obtained by interviewing patients to obtain qualitative data.

During the implementation period, patient call light use was reduced by 31%. It is projected that if nursing round compliance rates continue to improve, the frequency of call light use will be reduced further.

Results from this implementation are consistent with a clinical evidence review study conducted by Halm (2009). Both the implementation and study indicated that nursing rounds reduced call light use, reduced falls and increased patient satisfaction. Protocols between the implementation and study are similar except that this study included attending to matters regarding medications. This nursing activity is included in the protocol because it is the second highest reason for the use of call lights in the unit.

Facilitators of implementation

When using the GRIP process to identify barriers and strategies to improve nursing round compliance, nurses were empowered to problem solve. When nurses are empowered, it fosters their participation in providing best solutions for patients. Empowerment also gives nurses a sense of meaningfulness and usefulness in their jobs. These will in turn translate into better job satisfaction. The organisation benefits from empowerment as nurses can then relate and be in congruence with the organisation’s vision and values.

Role models played an important part in achieving improved compliance in nursing rounds. A role model is someone who sets a positive example and is worthy of imitation. Role modelling is proven to be an effective strategy in improving clinical behaviours by setting norms for the rest to follow to assure future provision of quality care.
GRIP sessions were conducted in individual sessions with the nurses. One-on-one coaching is the most apt vehicle to promote individual receptiveness when a change of behaviour is required. The individual attention given enhances the nurses’ perception that each and every one is vital to contributing to better patient outcomes when they perform nursing rounds. The perception in turn increases the likelihood of practice change. Through coaching, nurses are encouraged to work creatively on problems that surface in the implementation of nursing rounds. Nurses are also able to handle problems in a positive and constructive way. Therefore, it is important to invest time in coaching when introducing best practice to nurses.

Personal engagement with the nurses encourages them to be physically, cognitively and emotionally connected to their role performance. A literature review by Simpson (2009) demonstrated a positive relationship between engaging employees at work and customer satisfaction and productivity. Therefore, it would be beneficial to perform individual engagement during best practice implementation to encourage behaviours that could improve patient outcomes.

Barriers to implementation
Resistance to change is a major barrier across all kinds of organisations. However, successful change can occur with time and good leadership. Subsequent post implementation audit compliance rates will improve. Therefore, a plan to perform continuous GRIP, post implementation audits and sharing sessions will continue until the objective of meeting 100% compliance in nursing rounds is achieved.

While nursing rounds is a simple and cost-effective strategy, it is challenging to change nurses’ mindsets and the unit culture in order to implement the strategy. To deal with these challenges, the nursing round team employed a broad spectrum of leaders in the unit to act as role models. Nurse clinicians, opinion leaders and fall champions were selected to be role models. Leaders who act as role models can promote a culture committed to quality improvement and advocate adaptability towards changes for better outcomes.

Lessons learnt
Data collection occurred throughout the entire day through direct observation. It would have been less of a strain on the two auditors if the team had recruited more auditors.

It is important to consider patients’ perspectives and preferences when implementing any changes that involve them. In nursing rounds, there were patients who verbalised that they did not want to be rounded at the intended frequencies despite our explaining the benefits. The team was not prepared to face patients’ perspectives and preferences, and was not able to advise the participants on how to handle the situation.

Junior nurses were not forthcoming in the GRIP sessions. They might have been lacking in knowledge which made it difficult for them to understand data, evidence and reports. Consequently, they lacked the confidence that they had the capability to participate and contribute to the quality improvement initiative.

Conclusions
Although the implementation did not achieve one of its objectives, which was to achieve 100% compliance in nursing rounds, there was a twofold increase in compliance for all audit criteria. The implementation can also conclude that nursing rounds are the key in reducing call light use, reducing fall rates and increasing patient satisfaction. As a change agent in the unit, the leader has to accept unmet objectives. What is important is continual reflection on how to improve and refine the qualities of a change agent. The facilitators and barriers experienced in the course of implementing nursing rounds are major learning points that can be applied in many areas of changed practices in the unit. The nursing rounds team and its supervisors will continue to implement and support the quality improvement initiative as it has proven to have positive outcomes.

Acknowledgements
The project team would like to thank Dr Emily Ang for the opportunity to take part in the Evidence-based Clinical Fellowship Program, and for her direction and guidance during the course of the project. The project team would also like to thank Senior Nurse Clinician Chow Ying Leng and Nurse Clinician Dora Lang for their invaluable support and assistance. The project team would like to thank all nurses from Ward 8A of National University Hospital for their participation in the nursing rounds implementation.
References


Appendix 1: Pre-implementation reasons for call light use
## Appendix 2: Nursing rounds audit tools

<table>
<thead>
<tr>
<th>S/N</th>
<th>Criterion</th>
<th>Observation</th>
<th>Validate documentation</th>
<th>Met</th>
<th>Not Met</th>
<th>NA</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nurses perform nursing rounds in individual patients' rooms during identified gap intervals whereby there are no routine nursing activities in the patients' rooms.</td>
<td>RNs and ANs enter their assigned patients' rooms At identified gap intervals whereby there are no routine nursing activities: 8am – 9am 9am – 10am 3-4pm 4-5pm 5-6pm 6-7pm 9-11pm 11pm-1am 1-3am 3-5am 5-7am</td>
<td>Direct observation that nurses have entered patients' rooms during the identified gap intervals.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>There is documented evidence that nursing rounds are performed at intervals whereby there are no routine nursing activities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nurses proactively engage in specific nursing activities to meet patients' safety and essential needs and comfort during the nursing rounds.</td>
<td>RNs and ANs display quality presence by offering the following nursing care by: Prompting elimination Manipulating environment for comfort and safety Position Room temperature Possession Pre-empting completion time of all IV therapies Offering assistance in food</td>
<td>Direct observations that nurses have indicated that they have offered the stipulated nursing care.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3: Pre-implementation audit results

Nursing Rounds Team

1. Hourly nursing rounds are conducted at a stipulated time during awake hours. (19 of 19 samples taken)

2. Hourly or 2 hourly nursing rounds are conducted during sleeping hours. (19 of 19 samples taken)

3. A protocol is used by nurses when conducting rounds. (19 of 19 samples taken)

Appendix 4: Getting Research Into Practice (GRIP) for nursing rounds during the implementation phase

<table>
<thead>
<tr>
<th>Barrier No 1</th>
<th>Nurses are not used to incorporating nursing rounds into their daily routine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategies</td>
<td>Cues with timings and what to do</td>
</tr>
<tr>
<td></td>
<td>Role modeling</td>
</tr>
<tr>
<td>Resource</td>
<td>Stakeholders</td>
</tr>
<tr>
<td>Barrier No 2</td>
<td>Double rounds or missed rounds due to assumption colleagues had already rounded</td>
</tr>
<tr>
<td>Strategies</td>
<td>Log sheets</td>
</tr>
<tr>
<td></td>
<td>Encourage communications</td>
</tr>
<tr>
<td>Resource</td>
<td>Stakeholders</td>
</tr>
<tr>
<td>Barrier No 3</td>
<td>Nurses assumed that patients do not like to be ‘disturbed’ so often</td>
</tr>
<tr>
<td>Strategy</td>
<td>Orientation to patients</td>
</tr>
<tr>
<td>Resource</td>
<td>Patient orientation guide</td>
</tr>
</tbody>
</table>
Appendix 5: Pre- and post implementation nursing rounds audit results

Nursing Rounds Team

1. Hourly nursing rounds are conducted at a stipulated time during awake hours. (19 of 19 samples taken)

2. Hourly or 2 hourly nursing rounds are conducted during sleeping hours. (19 of 19 samples taken)

3. A protocol is used by nurses when conducting rounds. (19 of 19 samples taken)

Appendix 6: Pre- and post implementation reasons for call light use
Dipstick urinalysis practice among nurses in an adult oncology ward: a best practice implementation project

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Abstract

Background
Dipstick urinalysis or reagent strip testing is a basic diagnostic instrument used to determine pathological changes in the urine in standard urinalysis. The urine testing reading time among nurses in the inpatient oncology area has been observed to be varied.

Aim
The aim of this project was to standardise the practice of dipstick urinalysis for accurate detection of abnormalities for early intervention and improved patient outcome.

Methods
The method used was in accordance with the process embedded within the Joanna Briggs’s Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) programs. It is an online tool that facilitates the process of change using an audit, feedback and re-audit cycle as a strategy to improve practice. The project was implemented over six months.

Results
During the baseline audit, 97% of nurses documented the assessment of urine colour, clarity and odour; 93% explained to the patients the reason for testing and method of collection; only 33% followed hospital policy or manufacturer’s guidelines on reading time.

The post implementation audit showed that 100% was achieved in the area of documenting the nature of urine. 95% of nurses complied with providing explanations to patients for urine testing. There was a significant improvement, from 33% to 90% of nurses performing the correct reading time.

Conclusion: This quality improvement project has reduced practice variation and brought about significant improvement in nurses practising dipstick urinalysis according to the manufacturer’s instructions or best practice criteria. Best practice in dipstick urinalysis can lead to early detection of abnormalities and escalation for improved patient outcome.

Keywords: urine, dipstick, urinalysis, urine test, urine sample
Background:

Dipstick urinalysis or reagent strip testing is a basic diagnostic instrument used to determine pathological changes in the urine in standard urinalysis. It is a common method used for screening of systemic disease and diagnosis of suspected conditions, and aids in care planning and management. It is also a quick and cost effective method of screening which reduces the need for further diagnostic investigation. A reagent strip may comprise up to 10 different chemical pads or reagents which react (change colour) when immersed in, and then removed from, a urine sample. According to the manufacturer’s instructions, the reagent strip can be read between 60 and 120 seconds or one to two minutes after immersing into a urine sample. Inaccurate reading time and/or contaminated specimens may yield false-negative or false-positive readings. Therefore the reagent strip testing needs to be performed on urine samples within two hours from the time of collection.

In the adult inpatient oncology area of National University Cancer Institute Singapore (NCIS), dipstick urinalysis is performed on all patients who are newly admitted to the ward for basic screening of abnormalities. It forms part of the initial patient assessment. Additionally, it is indicated for those who require monitoring for treatment-related side effects such as haemorrhagic cystitis and urine acidity related to chemotherapy. Nurses working in the department have undergone mass training on dipstick urinalysis during their initial induction period so as to be competent in the jobs. However, the urine test reading time among nurses in the inpatient oncology area has been observed to be varied. This has negative implications on care planning and management. For example, oncology patients who receive alkylating cytotoxic agents such as Ifosphamide and Cyclophosphamide are required to be screened with the dipstick method for pH and blood, in line with the institutional protocol and WHO recommendations. Depending on the test results, treatment may be adjusted based on standing orders, or the nurse may notify the physician for further investigation and evaluation of treatment. However, if the dipstick reading is inaccurate, abnormalities will not be detected for early treatment or escalation, leading to unintended complications or negative outcomes to the patient.

In order to standardise the practice in dipstick urinalysis in the inpatient oncology area, the project team sourced evidence-based practice from the Joanna Briggs Institute (JBI) database. The evidence criteria from JBI stated that the manufacturer’s instructions on reading time of the reagent are to be followed. Other criteria include the need for documentation on assessment of colour, clarity and odour of urine. In addition there should be an organisational policy and/or procedure stating that prior to obtaining a specimen, the reason for testing and the method of collection are to be explained to the client.

Audit question

To what extent are we practising dipstick urinalysis according to the manufacturer’s instructions?

Aim

The overall aim of the project was to standardise practices in dipstick urinalysis for accurate detection of abnormalities for early intervention and improved patient outcome.

The objectives were:

- To achieve 100% compliance in documentation of assessment of urine colour, clarity and odour
- To achieve 100% compliance in explaining the reason for testing and the method of collection to the client
- To achieve 80% compliance in reading time

Methods

Ethical considerations

The audit process involved observing the practice of nurses and interviewing of patients. All names were kept confidential. Being a quality improvement project, formal approval was not required.

Phase 1: Preparation of pre-implementation audit (16 to 30 July 2012)

Identification of topic

The topic selected for the audit is ‘dipstick urinalysis as urine test reading time among nurses in the inpatient oncology area has been observed to be varied’.
Establishment of audit team
A small project team was created comprising three registered nurses (RN). The first RN was the leader of the team and also the nurse educator of the ward. The second RN was the co-leader and the third RN was a senior staff working together with the team in the clinical area. All three were involved in data collection during the pre-implementation audit. The key stakeholder was the Nurse Manager in charge of the ward. The team held a meeting with the stakeholder and informed her of the project.

Setting up of JBI-PACES
The details of the audit were formulated into JBI-PACES. The details were: setting up the audit team, adding new members, allocating team roles, setting the audit type, and completing the sample size.

Description of audit topic
The topic chosen for the audit was ‘dipstick urinalysis that was in accordance to best practice criteria developed by JBI on urine specimen ward testing’. All three criteria from JBI-PACES were utilised in this project. Below are the details of the assessment of compliance:

Criterion 1: Assessment of colour, clarity and odour of urine is documented.
Compliance: There was 100% documentation of urine colour, clarity and odour of urine.

Criterion 2: Organisational policy and/or procedure states that prior to obtaining a specimen, the reason for testing and the method of collection are explained to the client.
Compliance: All nurses explained the reason for testing and the method of collection to the client.

Criterion 3: Organisational policy and/or procedure states that the manufacturer’s instructions on reading time of the reagent are to be followed.
Compliance: 80% of the test was visually read at 60-120 seconds and urine specimens were tested within two hours of collection.

Conducting of baseline audit
A baseline audit was conducted on 30 staff (registered nurses and enrolled nurses) working in an adult inpatient oncology ward within an acute care teaching hospital. It was conducted over four weeks using JBI-PACES. The sampling was conducted only in one ward as it was a pilot study.

The project team identified patients who were newly-admitted and others who required dipstick urinalysis. The staff notified the project team whenever they were going to conduct dipstick urinalysis on these groups of patients. To audit on compliance to documentation, relevant clinical notes were audited for documented assessment. When explanation by staff was not observed, patients were interviewed by the project team about explanations provided.

Phase 2: Implementation phase (3 Sept to 28 Oct 2012)
From the baseline audit, the project team identified the areas of non-compliance. The team leader conducted group and individual sessions using visual aids to engage with the staff. In these sessions, the team leader shared the pre-audit results and utilised the best practice criteria to encourage staff to discuss on practice variations and brainstorm strategies for improvement. Barriers and strategies were analysed using Getting research into Practice (GRIP) embedded in the JBI-PACES. (Table 1)

Barriers and strategies
Distraction by other personnel and pre-occupation with other nursing activities were contributing factors for the non-compliance in criterion 1, assessment of colour, clarity and odour of urine is documented. The strategy to overcome this barrier was to practise checking and updating charts and notes at routinely within the shift and upon handover.

For non-compliance to criterion 2, language barriers prevented staff from explaining to patients the reason for testing and the method of collection. The staff suggested that if they encountered communication problems, they would engage the help of another nursing colleague who was able to communicate and explain the procedure in the language/dialect of the patient, as language barriers could be overcome by translation.

The barriers that were affecting the non-compliance in criterion 3, the need to follow the manufacturer’s instructions on reading time, were the lack of knowledge and timing device in ensuring consistency in the reading time. Based on information sharing and feedback sessions with staff, it was suggested that a wall clock with minute and second hands be installed in the dirty utility room. In addition, a coloured poster highlighting the importance of one-minute testing and the possible indications was to be displayed near the testing area. This would serve as a visual and constant reminder of the right practice. Visual learning is one of the most popular learning styles.
Phase 3: Post-implementation phase (29 Oct to 30 Nov 2012)

Conducting of post implementation audit

A post implementation audit was conducted on the staff (RN and EN) in the same adult inpatient oncology ward. The intended sample size was 30 over a four-week period. However, the actual sample size achieved was 20. In order to prevent the Hawthorne effect when auditing for compliance to reading time under criterion 3, the project team engaged a group of 16 student nurses to help in auditing the staff during the post implementation period. The student nurses were in their second and final year doing their final clinical attachment in the ward and had been previously assessed to be competent in the skill related to criterion 3. All of them were briefed by the team leader in the presence of their clinical facilitator on their role in assisting with the post-implementation audit.

The students were instructed to approach the staff whenever a urine dipstick testing was required. The staff were observed either on their demonstrated practice or on how they taught or corrected the practice of the student nurses. Their observations were then reported to the project team.

Results

Baseline audit findings

97% of nurses documented the assessment of urine colour, clarity and odour; 93% explained to the patients the reason for testing and method of collection; only 33% followed hospital policy or manufacturer's guidelines on reading time (refer Appendix 2).

Post implementation audit findings

After implementation of the action plan based on best practice guidelines, 100% of nurses documented the assessment of urine colour, clarity and odour; 95% explained to the patients the reason for testing and method of collection; 90% followed hospital policy or manufacturer's instructions on reading time (Refer Appendix 3).

Discussion

Criterion 1: Assessment of colour, clarity and odour of urine is documented

Documentation serves as a written communication among the multidisciplinary team who were involved in patient care and treatment for continuity of care. In the adult inpatient oncology area, the assessment of urine may be recorded in one or more documents which make up the patients' notes. Relevant and timely documentation of urine colour, clarity and odour facilitates correlation with the urine dipstick test findings, team communication and early escalation of any abnormality for appropriate management.9

In criterion 1, there was an improvement in compliance from 97% to 100%.

The success factors in achieving 100% for this criterion were that the project team consistently reinforced to staff the importance of the attitude of being meticulous and of completing their nursing documentation including assessment of urine timely. The ward practised checking and updating of patient's clinical charts and notes at routine times within the shift and upon handover. This practice had been followed diligently which enabled the nurses to remind or facilitate one another in following up with basic documentation such as any urine assessment performed within the shift or day for escalation as needed.

Criterion 2: Organisational policy and/or procedure states that prior to obtaining a specimen, the reason for testing and the method of collection are explained to the client

Explaining to patients the appropriate method of collection encourages compliance and helps to ensure collection of a clean specimen, reducing the risk of contamination and unintended false readings. More than 50% of the staff were foreign nurses who were not conversant in the dialects spoken by local patients. Communication is of special concern and explaining to patients can be a challenge for effective nursing care delivery where both patients and nurses, including the locals, come from diverse ethnic and language backgrounds.

In criterion 2, there was a slight improvement of 2%, from 93% to 95%. This slight improvement would be the verbal reinforcement by the project team that explaining the indication or reason for any investigation or procedure fulfills the patient’s right to know and make informed decisions concerning his own care.11 Regardless of the method or language of communication, the nurse is obliged to provide an explanation of the reason for urine testing to the patient. Therefore the staff need to get help from their colleagues or others who are able to communicate and explain the procedure in the language/dialect of the patient whenever they encounter language barriers.
Criterion 3: Organisational policy and/or procedure states that the manufacturer’s instructions on reading time of the reagent are to be followed

Although staff had been taught and assessed on their competence in urine dipstick testing during their initial induction period, many either could not recall the specific instructions or could not state the correct reading duration, citing timings of less than one minute or upon noticing expected colour change(s). However in the post implementation audit, there was a significant improvement of 33% to 90%. The success of the significant improvement was attributable to the project team engaging staff through group and individual educational sessions to address knowledge gaps, highlighting that inaccurate reading times could lead to negative consequences, whereas abnormalities detected from proper urinalysis could be promptly escalated to the doctors for further evaluation and management. Anecdotes were also relayed for learning about how correct practices had made an impact on patient care.

Other contributing factors were the display of a coloured poster in the test area to serve as a constant visual reminder of the right practice, as visual learning is one of the most popular and effective learning style. This poster highlighted the indications for urine dipstick analysis and appropriate timing for strip interpretation. A wall clock with a second hand was also installed to facilitate accurate time reading.

Limitation

The post implementation sample size of 20 varied from the pre-implementation audit sample size of 30. Student nurses were engaged to assist with the data collection to prevent the Hawthorne effect.

Lessons learnt

From this project, team members learned to develop leadership skills and exert a positive influence on colleagues to instigate change in nursing practices to improve patient clinical outcomes. Teamwork was exercised among project team members and the collaboration of nursing students was appreciated. The audit results showed that variation in nursing practices even in basic skills called for a review of available evidence for the purpose of re-education based on best practice. Knowledge or skills previously acquired may require refresher training or re-assessment to maintain competence for safe nursing practice.

Sustenance plan

A self-audit among nurses is being considered for six months after the completion of phase 3. Self-audit is a form of self-assessment and has been reported to improve practice and is also the most common form of competence assessment. Input from a facilitator was identified as an important factor in helping to address identified gaps. Reported benefits of self-assessment include cost effectiveness, maintenance or improvement of practice through the identification of strengths and areas for further development. It gives the individual conscious control over his own practice. However, reported issues with self-assessment such as subjectivity and concerns with negative experiences will also be taken into consideration.

Conclusion

This quality improvement project has reduced practice variation and brought about significant improvement in nurses’ practice of dipstick urinalysis according to the manufacturer’s instructions or best practice criteria. Urine dipstick has been a useful and cost-effective screening method in the oncology setting in NCIS. With standardisation of practice in dipstick urinalysis among nurses, abnormalities can be accurately detected for early intervention and improved patient outcomes. And being in a teaching hospital, nurses who are competent in the practice are also in the position to demonstrate and teach junior nurses the correct practice. To sustain nurses’ competence in best practice, self-audit is being considered.

In the course of the project, it was learnt that there are alternative (electronic) devices for quick urinalysis in the market and which yield greater accuracy. However, where electronic device fails, the conventional dipstick testing method would still be required which nurses are to be competent in performing.

Acknowledgement

We would like to thank and acknowledge Dr Emily Ang and Senior Nurse Clinician Chow Ying Leng for organising the JBI Fellowship Program, for their enriching lectures and teaching, and our ward Nurse Manager Amanda Kok for facilitating this quality improvement project.
References


Table 1: Barriers and strategies

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Strategies</th>
<th>Resources</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>Practise routine check and update initial assessment</td>
<td>Clinical charts</td>
<td>Nurses’ increased awareness and compliance in documentation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nursing notes</td>
<td></td>
</tr>
<tr>
<td>Language</td>
<td>Obtain translation</td>
<td>Nursing colleagues</td>
<td>Patients received explanation on reasons for testing and method of collection</td>
</tr>
<tr>
<td>Reading time</td>
<td>Highlight one-minute testing and possible indications</td>
<td>Poster</td>
<td>Nurses’ improved knowledge and skills competence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wall clock</td>
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</tr>
</tbody>
</table>
Figure 1: Baseline audit
Criteria legend

1. Assessment of colour, clarity and odour of urine is documented (30 of 30 samples taken)
2. Organizational policy and/or procedure states that prior to obtaining a specimen, the reason for testing and the method of collection are explained to the resident/client (30 of 30 samples taken)
3. Organizational policy and/or procedure states that the manufacturers instructions on reading time of the reagent are to be followed (30 of 30 samples taken)

Figure 2: Post implementation audit
Criteria legend

4. Assessment of colour, clarity and odour of urine is documented (20 of 20 samples taken)
5. Organizational policy and/or procedure states that prior to obtaining a specimen, the reason for testing and the method of collection are explained to the resident/client (20 of 20 samples taken)
6. Organizational policy and/or procedure states that the manufacturers instructions on reading time of the reagent are to be followed (20 of 20 samples taken)
Correct placement of blood pressure cuffs: an evidence utilisation project

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Abstract

Aim:
The aim of this project was to educate staff nurses and enrolled nurses on the correct placement of blood pressure cuffs, and monitor compliance of the audit criteria to best practice.

Methods:
This project adopted a pre- and post implementation audit approach. It utilised the Joanna Briggs Institute (JBI) Practical Application of Clinical Evidence System (PACES) and Getting Research into Practice (GRIP) programs. The project utilised three audit criteria based on best practice standards. The audit took place in a 10-bed oncology high-dependency unit that involved 24 nurses.

Result:
The post implementation audit findings revealed an improvement to all the three criteria. The first criterion scored 100% consistent documentation of blood pressure measurement in the clinical charts by the nurses. The second criterion showed a 50% improvement in the correct placement of blood pressure cuffs on the arm circumference. Lastly, criterion 3 achieved a 12% improvement in compliance for maintaining the patient’s arm at the heart level.

Conclusion:
This project highlighted the need for strategies to implement evidence in clinical practice. These strategies include planning a systematic process, using the JBI best practice sheets, involving relevant stakeholders and using multi-faceted approaches. Having a committed and enthusiastic team contributed to the positive outcomes. The challenge now is to develop strategies in sustaining the momentum of compliance, and embed the new evidence into routine clinical practice.

Keywords:
blood pressure, blood pressure cuff, correct placement, high dependency, vital signs

Background

Blood pressure refers to the force exerted against the blood vessels wall as the heart pumps the blood into the circulation. It is one of the vital signs used to determine hemodynamic deviation of the body. Measuring the blood pressure either by invasive or non-invasive methods can detect the hemodynamic deviation. A sphygmomanometer and stethoscope are used to measure blood pressure. They are used in screening for hypertension, estimating cardiovascular risk, diagnosing, managing, and treating acute and chronic medical conditions. Thus, it is necessary for health care professionals to measure the blood pressure accurately. However, Ersoy stated that blood measurement is one of the common and perhaps, most inaccurate procedures performed by health professionals in practice. The factors affecting blood pressure reading include use of cuffs of an inappropriate size, the site of measurement, positioning, use of the bell or the diaphragm of the stethoscope and activity.

The High Dependency Unit of a Cancer Centre in Singapore provides an environment for critically-ill patients, with hematology oncology patients receiving high-level intensive care. These patients require close monitoring of their blood pressure including other vital signs to detect early signs of deterioration in their condition. However, there is a variation in practice amongst the nurses in the placement of the blood pressure cuff. Thus, the accuracy of the blood pressure readings documented on the clinical charts is questionable. This project therefore aimed to determine the nurses’ practice in the placement of the blood pressure cuff, and if this was in line with current evidence-based practice recommendations.
Audit question
What are the blood pressure cuff placement practices of nurses working in the 32-beds oncology ward, and are these practices in line with the current evidence-based practice recommendations?

Aims
The aims of this project were to improve the local practice in relation to the placement of blood pressure cuffs, and to ensure that the nurses follow recommended best practice standards.

Audit criteria
The audit utilised the three criteria from JBI-PACES.5, 6

Criterion 1: Blood pressure measurement is documented.
This criterion is considered met if there is an evidence of documentation in the clinical chart.

Criterion 2: Organisational policy and/or the procedures manual stipulates that the cuff width should be at least 80% of the circumference of the arm.
This criterion is considered met if the auditors observe nurses choosing a cuff of a correct size for a particular patient.

Criterion 3: Organisational policy and/or the procedures manual stipulates that the resident’s/client’s arm should be maintained at the heart level.
This criterion is considered met if the auditors observe the nurses positioning the patient’s arm at the heart level.

Setting and sample
The setting for this project is a 32-bed oncology ward located within a 900-bed acute care hospital in Singapore. The ward comprises 10 high-dependency beds, and 22 secure beds for medical oncology and haematology-oncology patients. The ward has a total of 45 registered and enrolled nurses during the period of this project. As this was a pilot study, a total of 14 registered nurses working in the High Dependency area of the wards and 10 enrolled nurses participated. The registered nurses were providing nursing care to the critically-ill patients, and correct placement of the blood pressure cuff is vital in ensuring accuracy of the readings. Likewise, the primary role of the enrolled nurses is to monitor vital signs, hence accuracy in blood pressure measurement is essential.

Methods

Ethical considerations
This project did not require ethical approval as the institution considered this project a quality improvement initiative. However, the team followed the ethical principles of confidentiality and anonymity at all times. There was no identification of the nurses during data collection, analysis and report writing.

Approach
This project used a pre- and post audit and feedback strategy. The audit measured compliance against a set of three best practice standards. It also utilised JBI-PACES, a user-friendly online audit program of JBI.5 The project was implemented over six months, from 4 July to 30 November 2011, and in three phases:

Phase 1: Planning phase (4 July to 28 August 2011)
Identification of best available evidence:
Phase I involved researching and reviewing the best available evidence in JBI-PACES and determining a set of criteria to meet the required standard.

Establishment of audit team:
The project team comprised a leader, a co-leader and three senior nurses – a Senior Nurse Clinician, a Nurse Manager, and a Nurse Educator. The project team also included two Staff Nurses who served as auditors. The leader shared with team members and stakeholders the details of the project. It covered the aims and significance of the project, the timeline and the audit process. This was to facilitate common understanding among team members and stakeholders. The key stakeholders gave their expert opinion to ensure the smooth running of the project.
The Nurse Manager supported this project by giving team members time to undertake the project, and granting their request to purchase additional blood pressure cuffs. The team met for one hour every other month and the meetings were held from 3pm to 4pm. In addition, the team also communicated with each other via telephone and email.

Resources:
The Nurse Manager purchased an additional of 40 blood pressure cuffs of varying sizes, and documented these to assist with tracking of the items. The Nurse Manager also allocated a storage area for all the blood pressure cuffs, organised according to sizes. The team leader solicited help from all nurses in maintaining the tidiness, accessibility, availability and the quality of blood pressure cuffs.

The team developed steps and made available pictures showing (1) placement of the blood pressure cuff over the antecubital fossa, (2) a patient's arm positioned horizontally at the level of the heart, (3) the centre of the blood pressure bladder positioned above the brachial artery and popliteal fossa, and (4) blood pressure cuffs of varying sizes. These laminated pictures served as cue cards for the nurses (Figure 1), and were placed on the walls of every room just beside the blood pressure device.

Pre-implementation audit (18th July to 29th July 2011):
The auditors used a checklist (Table 1) to collect the data by observing 24 nurses performing the placement of blood pressure cuffs, and reviewing 24 clinical charts. Collection of pre-implementation audit data lasted for two weeks. The auditors observed a total of 14 staff nurses and 10 enrolled nurses against a set of three best practice standards. They then recorded their observations. The team leader entered the data into JBI-PACES, and the results generated in the form of bar charts.

Phase 2: Implementation of best practice (1st August to 25 October 2011)
Discussion on pre-implementation audit results
The project team members had a meeting with all the nurses to examine the percentage compliance of the audit results using the GRIP process. This involved three activities: situational analysis, action planning, and action taking. During the situational analysis, the team identified barriers to using correctly-sized of blood pressure cuffs and maintaining the arm at the heart level when measuring blood pressure.

Table 2 shows the action plan and actions to improve compliance for each audit. The team provided staff education regarding the importance of selecting appropriate cuff sizes based on the patient's arm circumference, and demonstrated the steps involved in applying blood pressure cuffs firmly at the centre of the bladder. The team initiated a change in clinical practice for patients who had axillary clearance for mastectomy, and superior vena cava obstruction. These patients require the application of blood pressure cuff above the popliteal fossa.

The team members used a variety of teaching methods to disseminate best practice standards to the nurses. The teaching methods used were one-on-one teaching and coaching using soft skills in providing feedback, and positive reinforcement when nurses implemented best practice standards.

Phase 3: Post implementation audit (27 October to 4 November 2011)
The post-implementation audit followed the same methodology as the pre-implementation audit.

Results
Figure 2 shows the results of pre-implementation audit. 100% (24) of the nurses documented the patients' blood pressure measurement in the clinical chart, indicating excellence best practice (criterion 1). Twelve of the 24 (50%) nurses audited used cuff widths of at least 80% of the circumference of the arm (criterion 2). Twenty one of the 24 (88%) nurses audited practised placing the patient's arm at the heart level before taking the blood pressure measurement (criterion 3). Figure 3 shows the results of the post-implementation audit. All the three criteria achieved 100% compliance.

Discussion
This project led to significant improvement in the correct placement of blood pressure cuffs. Documenting the blood pressure measurement in the clinical chart rated 100% compliance for both the pre- and post-implementation audits (criterion 1). It is gratifying to note that nurses are consistently maintaining the documentation. The success in raising awareness of the nurses saw an increase, from 50% to 100%, for criterion 2, and from 88% to 100% for criterion 3.
Several key factors had contributed towards the improvement in the implementation of practice change. Firstly, the leader and co-leader attended the six-month JBI Evidence-based Clinical Fellowship program where they received intense education on the process of evidence-based practice, and had access to a mentor to help them integrate evidence into practice. Secondly, they had access to resources such as additional blood pressure cuffs, and time given for members implement change. Adequate resources are a key determinant towards the success of any change in practice. Thirdly, individual engagement in communicating the desired change and reasons for the change helped to convince nurses to implement the change. Lastly, utilising the GRIP process gave stakeholders a sense of commitment and encouraged them to implement the change.

Sustenance of project
The team members will conduct an audit in three months’ time to check the compliance rate of the new practice. In addition, they will identify more nurses to help them in spreading the new practice to the rest of the registered nurses.

Conclusion
This project highlighted some essential strategies required to implement evidence in clinical practice. These strategies include planning a systematic process, involving relevant stakeholders and adopting multi-faceted strategies. Using JBI best practice is also another strategy to help busy clinicians undertake the arduous process of evidence synthesis. Having a committed and enthusiastic team had contributed to the positive outcomes. The challenge now is to develop strategies in sustaining the momentum of compliance, and embed the new evidence into routine clinical practice.

Acknowledgement
The project team would like to acknowledge the assistance of Dr Emily Ang and Chow Ying Leng, Senior Nurse Clinician, for guiding us through this project. The significant outcomes achieved in this project would not be possible without the support of the senior nurses, and all the nurses of Ward 58, National University Cancer Institute Singapore, NUHS. The authors would like to thank the NUHS Medical Publication Support Unit for their assistance in the preparation of this manuscript.

References
## Table 1: Blood pressure audit tools

Patient HRN no: .............................................................................
Ward/bed no: .................................................................................
Date of audit: ..................................................................................
Name of auditor: ............................................................................

<table>
<thead>
<tr>
<th>Audit Indicator</th>
<th>Criteria</th>
<th>Element</th>
<th>Audit Activity</th>
<th>Validation</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organisational policy and/or the procedures manual stipulates that the cuff width should be at least 80% of the circumference of the arm (picture)</td>
<td>RN selects appropriate size cuff based on the patient’s arm circumference: RN applies BP cuff above the: Ante cubital fossa (arm) Popliteal fossa (leg) RN secures cuff around the arm firmly at the centre of the bladder positioned over the brachial artery Refer to picture</td>
<td>Observation</td>
<td>Met</td>
<td>Not met</td>
</tr>
<tr>
<td>2</td>
<td>Organisational policy and/or the procedures manual stipulates that the resident’s/client’s arm should be maintained at the heart level (picture)</td>
<td>RN allows patient to rest for five minutes following activity before performing BP measurement RN positions patient’s arm horizontally at the level of the heart Refer to picture</td>
<td>Observation</td>
<td>Met</td>
<td>Not met</td>
</tr>
<tr>
<td>3</td>
<td>Blood pressure measurement is documented</td>
<td>There is documented evidence that BP is taken: on admission at least 3 times a day when patient’s condition changes</td>
<td>RN documents diastolic &amp; systolic BP reading on an hourly chart in red after measuring</td>
<td>Clinical Chart</td>
<td>Clinical Chart</td>
</tr>
</tbody>
</table>
### Table 2: Situational analysis, action planning and action taking

<table>
<thead>
<tr>
<th>Situational analysis</th>
<th>Action planning</th>
<th>Action taking (14 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50% of registered and enrolled nurses did not choose blood pressure cuffs of the correct size.</td>
<td>Staff education regarding the importance of selecting appropriate cuff size based on the patient’s arm circumference</td>
<td>Engaged staff in discussion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conducted one-on-one teaching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On-the-job training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Demonstrated the steps involved to apply blood pressure cuffs firmly at the centre of the bladder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changed the clinical practice to use blood pressure cuff above the popliteal fossa for patients contraindicated for upper limb monitoring eg bilateral cancer of the breast with axillary clearance and SVCO (Superior Vena Cava Obstruction)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Purchased blood pressure cuffs to ensure availability of different sizes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Developed cue cards. Placed cue cards on the wall next to wall-mounted blood pressure monitoring device inward 58HD</td>
</tr>
<tr>
<td>Nurses did not maintain the arm at the level of the heart when measuring blood pressure</td>
<td>Provide staff education on the importance of proper positioning</td>
<td>Demonstrated the steps involved to apply blood pressure cuffs at the level of the heart when measuring blood pressure and allowed patients to rest for five minutes before measuring blood pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provided feedback on nurses’ individual performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reinforced through the use of cue cards</td>
</tr>
</tbody>
</table>
**Figure 1: Pre-implementation results**

**Criterion 1:** Blood pressure measurement is documented (24 of 24 samples taken).

**Criterion 2:** Organisational policy and/or the procedures manual stipulates that the cuff width should be at least 80% of the circumference of the arm (24 of 24 samples taken).

**Criterion 3:** Organisational policy and/or the procedures manual stipulates that the resident’s/client’s arm should be maintained at the heart level (24 of 24 samples taken).

**Figure 2: Post implementation audit**

**Criterion 1:** Blood pressure measurement is documented (24 of 24 samples taken).

**Criterion 2:** Organisational policy and/or the procedures manual stipulates that the cuff width should be at least 80% of the circumference of the arm (24 of 24 samples taken).

**Criterion 3:** Organisational policy and/or the procedures manual stipulates that the resident’s/client’s arm should be maintained at the heart level (24 of 24 samples taken).
Figure 3: Cue cards for nurses

Ensure correct cuff size

Patient’s arm is positioned horizontally at the level of the heart

Cuff is secured firmly over the ante cubital fossa

Centre of the bladder positioned over the brachial artery

ALLOW FIVE MINUTES’ REST BEFORE BLOOD PRESSURE MEASUREMENT
Enhancing the WHO ‘My 5 moments of hand hygiene’ in a primary healthcare setting in Singapore

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Abstract

Aims:
This project aimed to enhance the compliance rate of nurses (registered nurses and enrolled nurses) in a primary healthcare setting based on the World Health Organisation (WHO) ‘My 5 moments of hand hygiene’ concept. It proposed to conduct a preliminary baseline audit on the standard of hand hygiene practice, to enhance the ‘My 5 moments of hand hygiene’ through road shows and follow-up mentoring in the primary healthcare setting and to conduct a post audit to capture the compliance rate of nurses on practising ‘My 5 moments of hand hygiene’.

Methods:
The team conducted a pre- and post audit using the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research Into Practice (GRIP) program from July 2011 through November 2011 over a period of five months. The pre-audit, which involved 23 nurses from a primary healthcare setting in Singapore, also adopted five out of the seven criteria suggested by JBI.

Results:
the post audit results showed a significant improvement in all five criteria, with the greatest improvement for criterion 2: hands are decontaminated immediately before each and every episode of direct patient contact or care, and/or all inanimate objects, including equipment.

Conclusion:
This study proved that hand hygiene compliance by nurses can be enhanced through a promotion and mentoring program. The five criteria gathered from the JBI-PACES, which is in line with ‘My 5 moments of hand hygiene’ represent best evidence practice for supporting the hand hygiene promotion and mentoring program. This project is to be contextualised and replicated in other primary health care settings in Singapore.

Keywords:
healthcare associated infection, hand hygiene, compliance, primary healthcare setting, nurses

Background
Hand hygiene is an effective method to protect patient against healthcare-associated infection. Numerous literature have found that healthcare-associated infections cause suffering, extended hospital stay, increased healthcare costs and mortality. The study showed that one-tenth of inpatients in Europe would develop healthcare-associated infections, which resulted in five thousand deaths and costing £930 million annually. Similar figures in other developed countries matched the above findings. This indicates that healthcare-associated infections are a serious risk to patients’ safety. Hand hygiene therefore needs to be promoted to prevent and reduce the transmission of pathogenic microorganisms.

In the local primary healthcare setting, patients first come into contact with healthcare workers when they seek treatment in the polyclinic.
Thus, it is essential for healthcare workers to maintain stringent personal hygiene standards to minimise the chances of them becoming a vehicle for microorganisms to spread from one point of contact to another. Following evidence-based guidelines recommended by a respectable organisation is the most effective way to maintain a high standard of hand hygiene.

The World Health Organization’s constitution states that its objective is the attainment by all people of the highest possible level of health. Its flag features the Rod of Asclepius as a symbol for healing. Therefore, our team will be using practices from this organisation to improve on our current hand hygiene practices.

‘My 5 moments of hand hygiene’ is the standard of practice advocated by the World Health Organization. This practice encourages healthcare workers to perform hand hygiene before and after touching a patient, before undertaking a procedure for a patient, after coming into contact with blood/body fluid and after touching the patient’s surroundings.

Research has shown that, during daily practice, it is likely that the patient could acquire healthcare-associated infection from contaminated hands of healthcare workers. Pathogens that are most likely to be spread via the hands of healthcare workers are Staphylococcus aureus (including MRSA), Streptococcus pyogenes (Group A Strep), Vancomycin-resistant Enterococcus (VRE) Klebsiella, Enterobacter, Pseudomonas, Clostridium difficile, Candida, Rotavirus, Adenovirus, Hepatitis A virus, Norovirus, etc.

The Singapore Ministry of Health’s polyclinics attendance chart revealed that patients in attendance at the polyclinics could reach up to a quarter a million per month, or more than 8,000 patients per day. Because of the high influx of patients into each polyclinic, it is of paramount importance that healthcare workers practise ‘My 5 moments of hand hygiene’ in the clinical setting to prevent, control and reduce the spread of pathogens that could cause healthcare-associated infections.

Hand hygiene practices have always been a priority in primary healthcare settings, and practices need to be reviewed and evaluated periodically. This is to ensure that hand hygiene practices are in alignment with the gold standard. Thus, it is essential to re-educate all healthcare workers on the new standard. Circulating guidelines on hand hygiene through a top-down approach alone is not enough to institute the new standard. Studies have shown that success in improving hand hygiene practices depends on the effectiveness of the education program. A successful hand hygiene education program should be able to increase awareness and knowledge regarding right hand hygiene practices, and motivate healthcare workers to practise the standards on a daily basis. WHO guidelines suggested the use of a wide range of educational tools such as presentation slides and training video to educate healthcare workers. In addition, it proposed that all the educational tools used should convey the idea of the right hand hygiene practice.

Auditing is essential to ensure compliance with ‘My 5 moments of hand hygiene’ to prevent transmission of infection to patients in the primary healthcare setting. WHO has recommended the gold standard of monitoring adherence to hand hygiene, that is, through direct observation of ‘My 5 moments of hand hygiene’. Therefore, we will endeavour to adopt the practice of ‘My 5 moments of hand hygiene’ through direct observation of hand hygiene practices by nurses.

Audit question
To what extent can we enhance the compliance rate of nurses (registered nurses and enrolled nurses) based on ‘My 5 moments of hand hygiene’?

Aims/objectives
This project intended to enhance the compliance rate of nurses (registered nurses and enrolled nurses) in a primary healthcare setting based on the ‘My 5 moments of hand hygiene’ by:

- Conducting a preliminary baseline audit on the standard of hand hygiene practice.
- Enhancing the ‘My 5 moments of hand hygiene’ through road shows and follow-up mentoring in the clinical setting.
- Conducting a post audit to capture the compliance rate on practising the ‘My 5 moments of hand hygiene’.

Methods
The team conducted the pre- and post audit, using the JBI-PACES and GRIP programs. The audit was conducted over five months, from July to November 2011. This project encompassed four stages namely preparation, baseline audit, promotion and mentoring, and post promotion and mentoring audit.
Phase 1: Preparation period (1-21 July 2011)
The first phase entailed identifying a topic, forming a team, defining the role and responsibilities, using the JBI-PACES and GRIP programs, selecting audit criteria, developing training slides/video, and identifying settings and sample size.

Identifying a topic
The topic of this project was ‘Enhancing the WHO “My 5 Moments of Hand Hygiene” in a Primary Healthcare Setting in Singapore’. The project team selected this topic because hand hygiene practices have always been given the highest priority in primary healthcare.

Forming a team
The Director of Nursing nominated two senior registered nurses to participate in the Joanna Briggs’s Evidence-based Clinical Fellowship program. These two Senior Staff Nurses served as leader and co-leader. The other members were selected due to their assigned roles and responsibilities in primary healthcare, which included three Senior Staff Nurses and one Infection Control Nurse.

Roles and responsibilities
The leader discussed the details of the project, such as audit criteria, timeframe, etc, to the team. In addition, prior to audit, the team leader assessed the understanding of the auditor’s concept of ‘My 5 moments of hand hygiene’ on patient care and audit criteria. Any misconceptions or doubts were resolved beforehand to ensure validity and reliability of the audit results.

The appointed auditor is an Infection Control Advocate in another polyclinic. It was an intended arrangement to minimise observer bias. The auditor ensured that the audit was carried out in an unobtrusive way during the direct observational sessions to minimise the Hawthorne Effect.

The Infection Control Nurse was the inter-rater for the pre-/post audit to ensure auditing processes and findings are reliable and consistent. Members met or communicated via email at every phase of the project. This was to ensure seamless and consistent delivery of the project.

Using JBI-PACES and GRIP
The team members set up the details of the audit into JBI-PACES and GRIP. The two programs are online tools that allow users to conduct audits, generate feedback and improve practices.

Selecting audit criteria
The project utilised five out of the seven JBI hand hygiene audit criteria. The team chose the audit criteria based on the WHO-recommended evidence level of 1A and 1B. This was a direct observational audit, which was recognised as a gold standard in monitoring hand hygiene compliance by WHO.

The criteria were considered met if the nurse was observed performing the following:

i. **Criterion 1**: Hands are decontaminated immediately after contact with individual patient and/or all inanimate objects including equipment.

ii. **Criterion 2**: Hands are decontaminated immediately before each and every episode of direct patient contact or care, and/or contact with all inanimate objects including equipment.

iii. **Criterion 3**: Hands are decontaminated with an alcohol-based hand rub (unless hands are visibly soiled) between different care activities for the same patient.

iv. **Criterion 4**: Alcohol-based hand rubs are routinely used for hand hygiene unless hands are visibly soiled.

v. **Criterion 5**: Hands that are visibly soiled, or potentially grossly contaminated with dirt or organic material, are washed with liquid soap and water. Organic material may include but is not limited to body fluids or excretions, mucous membrane, non-intact skin or wound dressings.

vi. The reason for the exclusion of the other two criteria are as follows:

- **Criterion 6**: Hands are washed using an effective hand washing technique using three stages. Reason: Our team is not focusing on hand wash/rub techniques as the nurses are tested for their competency annually.

- **Criterion 7**: Staff members have received education about hand hygiene. Reason: Our leader will be conducting a road show to educate all nurses on ‘My 5 moments of hand hygiene’ in the polyclinic. Therefore, the need for auditing the nurses on the two criteria is not necessary.
Developing training slides/video
The leader assigned the responsibility for developing the training slides/video on the concept of ‘My 5 moments of hand hygiene’ in the polyclinic to the Infection Control Nurse.

Identifying the setting and sample size
The project involved the target population of 17 registered nurses and six enrolled nurses working in a primary healthcare setting in Singapore.

Phase 2: Baseline audit (22 July 2011 to 21 August 2011)
This phase involved a baseline audit to determine the extent that the WHO ‘My 5 moments of hand hygiene’ concept is practised by nurses in the primary healthcare setting and to identify barriers to non-compliance.

The team leader ensured that all 23 nurses were present for the audit. Simultaneously, during the auditing process, another auditor served as an inter-rater and she assessed the auditor for the audit criteria’s feasibility and appropriateness. The co-leader helped to enter the audit data into JBI-PACES. The team and nurses identified gaps in current hand hygiene practices based on the pre-audit results. They then identified three barriers with the assistance of GRIP.

The first barrier was inappropriate placement of alcohol-based hand rub dispensers at the point of care. The second barrier was the confusion by nurses over the concept of ‘My 5 moments of hand hygiene’. Thirdly, most of the nurses preferred hand washing rather than alcohol-based hand rubs.

Phase 3: Promotion and mentoring (22 August 2011 to 30 October 2011)
The team met and discussed with the Nurse Manager, the Clinical Improvement Officer and all nurses on the appropriate placement of alcohol based hand rub dispensers. This is to facilitate the adherence of ‘My 5 moments of hand hygiene’. Furthermore, the team explained and reinforced to the nurses on ‘My 5 moments of hand hygiene’. They also highlighted the gaps and variation of hand hygiene practices identified during the baseline audit. The team adopted an open communication approach in engaging the nurses to overcome adherence barriers. The leader assessed the nurses’ understanding of the ‘My 5 moments of hand hygiene’ concept, followed by randomly checking hand hygiene practices. She also provided guidance to the nurses in a non-intimidating manner, and reinforced the importance of hand hygiene when the need arose.

Phase 4: Post promotion and mentoring audit (1-30 November 2011)
The team leader arranged a meeting with project team members, and briefed the auditor on the audit process. The sample size for the post audit involved only 20 nurses as two of the registered nurses were on an advance diploma course, and one enrolled nurse was on long term leave.

A direct observatory audit was carried out two months after the promotion period. The same criteria for the Hawthorne Effect were observed during the audit process. Data gathered were then inputted into JBI-PACES and GRIP.

Ethical considerations
Formal ethical approval was not required in this project as this initiative was in alignment with improvement of the patient’s safety. Nurses involved in the audit were assured that their confidentiality and privacy were maintained.

Results

Baseline audit
The baseline audit results in figure 1 shows low (<50%) hand hygiene compliance. From the pre-audit results, eight out of 23 nurses (35%) decontaminated their hands immediately after contact with an individual patient and/or all inanimate objects including equipment (criterion 1). In addition, four out of the 23 nurses (17%) decontaminated their hands immediately before each and every episode of patient contact and/or all inanimate objects including equipment (criterion 2). Only one out of the 23 nurses (4%) decontaminated her hands between care activities for the same patients (criterion 3). During the pre-audit, only four out of the 23 nurses (17%) used alcohol-based hand rubs routinely, and only washed their hands when visibly soiled (criterion 4). Lastly, six out of the 23 nurses (26%) washed their hands when visibly soiled (criterion 5).
Post promotion and mentoring audit results

Figure 2 shows that the overall compliance rate has increased to more than 50% after the promotion, and follow-up mentoring program except for criterion 4. In criterion 1, nurses’ compliance accounted for 50% improvement compared with the baseline audit ($\chi^2=11.838$, $p=0.002$). Criterion 2 achieved 73% improvements ($\chi^2=25.330$, $p=0.000$). Criterion 3 demonstrated 51% improvement in nurses’ compliance ($\chi^2=15.166$, $p=0.000$). Criterion 4 represented only 38% improvement in compliance ($\chi^2=6.839$, $p=0.013$). Lastly, compliance for criterion 5 accounted for 54% improvement ($\chi^2=13.169$, $p=0.0001$). Nevertheless, every audit criterion revealed significant improvement with $p$ value $< 0.005$.

Discussion

Nurses’ hand hygiene compliance based on the best clinical practice was indeed enhanced through the road show and follow-up mentoring program. This project is the first to report a significant improvement in the hand hygiene compliance among primary healthcare nurses in Singapore. The increased awareness of the concept of ‘My 5 moments of hand hygiene’ contributed to a significant improvement of 73% in criterion 2. In addition, placement of alcohol-based hand rub dispensers within reach of the nurses facilitated the adherence of ‘My 5 moments of hand hygiene’.

Compliance with criterion 4 represented only a 38% improvement. The modest improvement in the result was because most nurses still prefer hand washing over using hand rubs. The reason given by the nurses was that alcohol-based hand rubs caused much irritation to their skin (eg dryness, itch, etc). However, this problem was resolved as nurses knew how to organise their patient-care activities to reduce the frequency of hand hygiene. In addition, another hand rub product that contains moisture retaining substances had replaced the alcohol-based hand rub. The team also reminded the nurses not to perform hand wash and hand rub concomitantly, so as to reduce irritation to the hands.

Overall, there is a positive result for all five criteria, and this outcome suggests that conceptualising ‘My 5 moments of hand hygiene’ in the clinical setting is critical in improving learning outcomes for nurses, and ultimately their hand hygiene practice. Moreover, collaboration efforts, enthusiasm and commitment of stakeholders, team members and nurses contributed towards the smooth running of the project even though there were time constraints. Another factor that led to the improvement of practice was the exploration of barriers to compliance from the ground. Open and honest communication assisted in identifying and tackling issues concerning poor compliance.

Limitation

WHO considers unobtrusive direct observation of hand hygiene compliance as the gold standard in monitoring hand hygiene compliance. However, observation and observer bias are deemed a reality. To reduce these effects, the team implemented WHO-recommended initiatives. In addition, the team validated and appointed auditors from other primary healthcare settings. The limitations of this project were the small sample size and involvement of only one healthcare institution. Thus, it is difficult to conclude that results are representative of a larger population.

Sustainment

Maintaining or improving hand hygiene compliance rate remains a challenge. Therefore, the team incorporated ‘My 5 moments of hand hygiene’ in the infection control audit held every quarterly, and in the orientation of new employees. Periodically, an infection control team will elicit feedback from the ground and provide guidance on hand hygiene practices. Promotion of ‘My 5 moments of hand hygiene’ will continue on a yearly basis in the primary healthcare setting.

Conclusion

This study has proven that nurses’ hand hygiene compliance can be enhanced through promotional and mentoring programs. The five criteria gathered from JBI-PACES, which is in line with the WHO ‘My 5 moments of hand hygiene’ represent best evidence practice for supporting the hand hygiene promotion and mentoring program. This project is to be contextualised and replicated to other primary healthcare settings in Singapore.
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Table 1: The number of samples for each criteria and the degree of compliance pre- and post audit

Legend: n, the total number audited; %Y, no. complied with criteria; %Y, percentage complied with criteria; X², likelihood ration; P, probability of a significance difference
Figure 1: Baseline audit
Criteria legend:
1. Hands are decontaminated immediately after contact with individual patient and or all inanimate objects including equipment.
2. Hands are decontaminated immediately before each and every episode of direct patient contact or care, and/or all inanimate objects including equipment.
3. Hands are decontaminated with alcohol based hand rub between care activities for the same patients (unless hands are visibly soiled).
4. Alcohol hand rub are routinely used for hand hygiene unless hands are visibly soiled.
5. Hands that are visibly soiled, or potentially grossly contaminated with dirt or organic material, are washed with liquid soap and water. Organic materials may include not limited to body fluids or excretions, mucous membrane, non-intact skin, or wound dressing.

Figure 2: Post promotion and mentoring audit
Criteria legend:
1. Hands are decontaminated immediately after contact with individual patient and or all inanimate objects including equipment.
2. Hands are decontaminated immediately before each and every episode of direct patient contact or care, and/or all inanimate objects including equipment.
3. Hands are decontaminated with alcohol based hand rub between care activities for the same patients (unless hands are visibly soiled).
4. Alcohol hand rub are routinely used for hand hygiene unless hands are visibly soiled.
5. Hands that are visibly soiled, or potentially grossly contaminated with dirt or organic material, are washed with liquid soap and water. Organic materials may include not limited to body fluids or excretions, mucous membrane, non-intact skin, or wound dressing.
Patient handover in the oncology setting: an evidence utilisation project

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Abstract
Aim: The aim of this project was to improve the quality and duration of inter-shift patient handover from morning to afternoon shifts.

Methods: This project utilised a pre- and post audit methodology using the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) programs. It was implemented in three phases over a six-month period from June 2011 to December 2011. The audit utilised four out of six criteria recommended by the JBI clinical handover best practice sheet. The audit took place in a 16-bed oncology ward within an acute care hospital in Singapore, involving a sample size of 15 registered nurses. It involved educating registered nurses in the process of patients' handover with the aid of cue cards.

Results: Comparison between pre- and post audit results showed significant improvement in criteria 2 to 4. There was an improvement of 20% for criteria 2 and 3 in handing over relevant history and detailed observations of the patient. In criteria 4, there was a significant improvement of 53% in the process of patients' handover.

Conclusion: This project not only showed a significant improvement in the inter-shift patient handover but also shortened the duration of handover by 21.67 minutes per registered nurse. Positive results were achieved through the commitment, acceptance, enthusiasm and support from all the registered nurses and project team members.

Keywords: acute care, cue card, handover, inter-shift, patient

Introduction
Handover refers to the transfer of accurate and relevant information about the patients' condition and anticipated needs from one nurse to another at the change of a shift to ensure continuity of care. Information shared during the handovers includes clinical information, functional status, clinical status and plan of care as well as emotional and social issues. Inter-shift handover is essential in building strong team morale and facilitates cohesiveness in a nursing unit. However, inter-shift handover can be ineffective and harmful to patients if the information communicated is incorrect, irrelevant or omitted. Hospitals in the United States and Australia cite that approximately 50% of Sentinel Events is as a result of communication failure between healthcare professionals. Thus, handover has an inherent risk to patient safety. In addition, the time spent in handover can be excessive, taking nurses away from direct care.

The duration of inter-shift handover depends on the patients’ load, acuity, and familiarity of the oncoming nurses with the patient, and range from five to 90 minutes. Moreover, there is distraction and interruption during the handover process which also prolongs the time spent in the handover. In addition, information passed from the medical notes, multi-disciplinary notes, information list, patient education records and clinical charts may be irrelevant, repeated or even unclear, which also extends the time. Walter (1997) and Meibner (2004) also state that there is no clear agreement about the content of information that should be exchanged. As such, the oncoming nurses become not productive if they do not have useful information. A structured handover procedure not only facilitates effective handover that will improve patient safety but also improves nurses’ satisfaction as they no longer need to work beyond their working hours.
Similar problems with inter-shift handover cited in the literature exist at the National Cancer Institute Singapore (NCIS). Nurses working in the oncology environment are taking more than an hour for inter-shift patient handovers, especially those for morning to afternoon shifts. Thus, the aim of this project was to improve the process and duration of the inter-shift patient handover.

Audit question
To what extent are our registered nurses engaging in best practice relating to inter-shift patient handover?

Aims/objectives
This project sought to improve the process and duration of inter-shift handover using the best available evidence. There were three objectives:

• To ensure the practice of inter-shift patient handover is performed according to best practice.
• To shorten the handover process.
• To monitor compliance to the audit criteria.

Methods
This project utilised the JBI-PACES and GRIP programs. This is an online tool which facilitates the process of change using an audit, feedback and re-audit cycle as a strategy to improve clinical practice. The oncology ward implemented the project over a period of six months, from June 2011 to December 2011, and in three phases.

Phase 1: Preparation for audit
Phase 1 involved the identification of topic, establishment of the audit team, identification of audit criteria, setting and sample size, and conducting a pre-implementation audit.

Identification of topic
The topic selected for the audit was 'Patient Handover in the Oncology Setting'. The team selected this topic to improve and shorten the duration for the handover process. This helps to improve patient satisfaction and increase the morale of the registered nurses to enable them to deliver better patient care.

Establishment of the audit team
The team comprised four members: the Nurse Manager, Nurse Clinician and Senior Staff Nurses. The Nurse Clinician led the project, a Senior Staff Nurse was the co-leader and another Senior Staff Nurse served as data collector. The ward Nurse Manager served as facilitator by helping out in scheduling of staff for the audit. The team leader selected the members based on their roles and responsibilities in the ward.

The project team briefed all the stakeholders on the purpose, details, importance and timeline of the project, compliance with audit criteria and the patient handover process. All members had training on the process of auditing, and the use of the JBI-PACES and GRIP programs. The members attended meetings every two weeks, and each meeting lasted no more than an hour. Team members and stakeholders addressed any concerns raised through open communication.

Identifying audit criteria
This project adopted four out of the six criteria recommended by JBI’s evidence summary on clinical handover. The team contextualised four criteria:

Criterion 1: Healthcare professionals (registered nurses) use a standardised procedure in the handover process.
Compliance: There is observational evidence that registered nurses are utilising the message board for general handover and the cue cards for physical assessment and patient handover.

Criterion 2: Handover should include both oral (face-to-face) communication and documentation.
Compliance: There is observational evidence that registered nurses are practising the handover process by oral communication and documentation of the patients’ condition and needs.

Criterion 3: Detailed observations of the patient have been stated.
Compliance: There is observational evidence that the registered nurses state the detailed observations of the patients during the handover process.
**Criterion 4:** The handover process includes an agreed plan of care for the patient.\(^6\)

**Compliance:** There is observational evidence that the registered nurses include an agreed plan of care for the patients during the handover process.

**Identifying setting and sample size**

This project took place in a 16-bed oncology ward within an acute care hospital in Singapore. The sample size included all 15 registered nurses working in the ward, as the registered nurses population is small. The project excluded the recently-graduated registered nurses and registered nurses that are deployed to the ward.

**Conducting the pre-implementation audit**

In July 2001, the audit team conducted a pre-audit to evaluate to what extent the current practice was reflective of best practice recommendations for inter-shift handover processes. The team conducted the audit between 1pm and 2pm when registered nurses on the morning shift were handing over the report on their patients to the oncoming shift registered nurses. The auditor chose this shift as there was more information to be handed over that required more time. In this audit, recently graduated registered nurses and deployed registered nurses were excluded. In order not to disrupt patient care, the team leader planned a timetable to enable auditors to do the audit using a specified time. The auditor arrived in the ward an hour prior to the arrival of the registered nurses working on the afternoon shift, and examined the patients’ medical and nursing records. The auditor continued to observe the registered nurses during the process of patients’ handover, which included a general report, information about the patients’ condition and needs, and physical examination. The time taken for the process of patients’ handover was recorded. All data was collected manually using pen and paper, inputted into the JBI-PACES program, and the results presented in a bar graph.

**Phase 2: Implementing best practice**

This phase involved analysis of the pre-audit results, dissemination of results to all nurses, analysis of barriers using GRIP, and developing strategies to improve practice.

The team leader presented the pre-implementation results to all the registered nurses and stakeholders using Powerpoint presentations. The team, registered nurses and stakeholder identified four barriers of GRIP, and developed strategies to improve the inter-shift patient handover process.

**Barrier 1:** The communication board contained irrelevant and redundant information.

**Strategy:** The communication board (Appendix 1) was revamped based on the registered nurses’ input. Slips were made for inserting the patient’s name for easier reference; headings such as ‘procedure’ and ‘risk of fall’ were clearly written.

**Barrier 2:** No clear guidelines on what to communicate during the verbal handover of the general report.

**Strategy:** laminated cue cards for general report and patients’ handover (Appendix 2 and 3) and clip board (Appendix 4) were developed. All nurses were briefed on the use of cue cards and clipboards.

**Barrier 3:** Nurses were not able to do a physical assessment of patients

**Strategy:** Pictorial cue cards (Appendix 5) on physical assessment were developed and pasted on the wall of every patient’s room, just above the headboard. The use of cue cards served as a prompt to the registered nurses.

**Strategies for improving compliance for each audit**

The team leader embarked on an educational program to all registered nurses working in the ward on the patient handover process, focusing on the four criteria and the compliance needed. The educational program was conducted on the first week of August at the multipurpose room in the ward between 3pm and 4pm. It was conducted over four sessions in small groups of three to four persons to facilitate open discussion.

The presentation comprised firstly on the need to change the current practice of patient handover based on the audit results. Secondly, it elaborated on the new changes to the general handover, the one-on-one handover report and physical examination. The team leader demonstrated how to use the communication board with the cue cards, emphasising the importance of details such as the patients’ name, diagnosis, doctor-in-charge, procedures, surgeries, how critical their conditions were and particular details such as ‘do not resuscitate’ (DNR), ‘dangerously ill list’ (DIL), etc. In addition, the entire process of handover and physical examination on patients were demonstrated in detail to the registered nurses (Appendix 3). The registered nurses were also reminded that the inter-shift handover of the general report will take place in the ward clean utility room to reduce interruption from patients, and that it should take no more than 10 minutes.
The team leader also demonstrated to all registered nurses on the use of cue cards in the patient handover, and what to document after taking over the handover report. The individual handover report was done outside the patient’s room using the case notes trolley, which comprised patient case notes, Electronic Integrated Medication Record (EIMR), monitoring charts (clinical chart, intake output chart, hourly monitoring chart, etc). The preceding staff nurse was taught to handover relevant and accurate patient’s information to the on-coming nurse within 15 to 20 minutes. Junior staff from both the preceding and taking-over shift looked after patients and answered all bells to minimise interruption and distraction. The ward clerk also helped to respond and filter phone calls. The registered nurses gave feedback that they preferred to do physical checks on patients after their individual handover. This helped them to understand their patients’ needs better. The registered nurses were also shown the steps for conducting a physical examination using the illustrated cue cards, lasting no more than ten minutes.

**Conducting post implementation audit**

The post implementation audit was conducted three months after the implementation of practice change, on the third and forth week of November 2011. It utilised the same methodology as that used in the pre-implementation audit. The stakeholders were asked if any further changes in practice were required based on the pre- and post audits results.

**Ethical considerations**

Ethical approval was not required for this quality improvement project. However, in keeping with the principles of ethical practice, confidentiality and anonymity were maintained at all times. No data that could identify an individual RN was collected; only aggregated data was reported.

**Results**

**Pre-implementation audit**

Figure 1 shows the results of the pre-implementation audit. Criteria 1 achieved 100% compliance whereas criteria 2 and 3 achieved 80% compliance. Criteria 4 achieved only 47% compliance, indicating poor compliance to best practice. The compliance rate for verbal handover using face-to-face communication among the 15 registered nurses audited was 100%. However, 80% (12) of the registered nurses audited achieved 100% compliance to criteria 2 and 3, and the compliance rate among the registered nurses to criteria 4 was 47% (5).

**Post implementation audit**

Figure 2 shows the results of the post implementation audit. The compliance rate increased for criteria 2, 3 and 4, showing significant improvement especially in criteria 4. Fisher’s exact test was carried out to determine statistical significance between results of the two audits (Table 1). Compliance for criteria 1 remains at 100%. Criteria 2 achieved 100% compliance compared with 80% in the pre-implementation audit, highlighting a significant improvement of 20%. The findings for criteria 3 were 100% compared with 80% in the pre-implementation audit, indicating a significant improvement of 20%. The result for criteria 4 was 100% compared with 53% in the pre-implementation audit, indicating a significant improvement of 47% with a p-value of less than 0.002.

**Discussion**

The post implementation audit took a longer time to complete: three weeks instead of the two weeks that was initially planned. This was due to several registered nurses who were away on medical and vacation leave. It is heartening to note that this pilot project had produced positive outcomes in all the four criteria.

**Criterion 1: Verbal (face-to-face) communication has occurred**

This criterion achieved 100% for the pre- and post implementation audits. The achievement could be attributed to two factors. Firstly, face-to-face verbal communication for inter-shift handover has always been the standard practice for nursing4. Secondly, both the ward clerk and enrolled nurses were asked to assist in attending to the patients’ needs during the inter-shift handover, resulting in minimal distractions and interruptions to the handover process.

**Criterion 2: Relevant history of the patient has been stated**

This criterion achieved a modest increase of 20% from, 80% to 100%. The use of cue cards, as well as the one-to-one coaching during the handover process probably contributed to the 20% increase in compliance.
Criterion 3: Detailed observations of the patient have been stated
An increased of 20% compliance for this criterion could probably be attributed to the use of physical examination cue cards, pasted on the wall located at the top of the patient headboard. The cue card serves as a prompt to the nurses when they are doing their physical examination.

Criterion 4: The handover process includes an agreed plan of care for the patients
This criterion yielded an increase from 47% to 100%. The increase of 53% is due to the educational session on proper general information handover, conducted over four sessions, in groups of three to four nurses. In addition, the communication board was revamped to include only relevant information. A clip board and cue card enabled expedient handover. In addition, a value stream mapping (Appendix 6) was done to compare the average time taken before and after implementation of best practice for the handover process (Appendix 7). The overall time saved was 173.4mins per shift for eight registered nurses. When translated in monetary value, the amount saved was $624. The findings indicate that multifaceted interventions led to improvement in the patient handover process in line with current evidence.

There were two strategies that contributed towards the success of this project. Firstly, all the registered nurses including the Nurse Manager were motivated and enthusiastic about wanting to improve the handover process. Second, the use of cue cards helps to serve as a prompt for the registered nurses.

Sustaining the project
All registered nurses will be audited again in three months’ time to validate the sustenance of best practice. The aim is to achieve the Joint Commission threshold of at least 90% compliance. All registered nurses will be involved in identifying the barriers if the compliance rate drops to ≤ 90%, and in developing an action plan to improve the compliance rate.

Conclusion
This project had shown that commitment, acceptance, enthusiasm and support from all the registered nurses and stakeholders are essential contributing factors towards the success of improving clinical practice. It also demonstrated that the use of evidence to improve clinical practice is possible in a challenging acute care environment.

Acknowledgement
The authors would like to acknowledge Dr Emily Ang and Ms Chow Ying Leng for providing us with the opportunity to complete the JBI Evidenced Based Clinical Fellowship program, their guidance in this project, which resulted in the writing of this paper. Finally, thanks to all the RNs who participated in this project, and Keren Heng, Nurse Manager, for her support.

References


Appendices

**Appendix 1: Communication board**

![Communication board image]
Appendix 1: General handover cue card

Instructions on team nursing
There are two teams: (when the ward has a staff quota of 4:2 or 4:1)
   Team A: 7-10, 17-20
   Team B: 2-6, 1,12-16
When there are only three registered nurses, the ward will be divided as follows:
   Staff A: 1-5,12
   Staff B: 15-19
   Staff C: 6-10, 20
   Assistant nurse: 1-20

Staff strength

Max: 4:2 or 4:1
Min: 3:2 or 3:1
When there is 4:2 quota, there will be two registered nurses and one assistant nurse
4:1 quota, there will be two registered nurses on each team and the assistant nurse is shared by the whole ward
3:2 quota, the ward will be divided into three and each team will have one assistant nurse
3:1 quota, the ward will be divided into three and the assistant nurse is shared by the whole ward

What to pass?
• Greet the staff and make sure all oncoming staff are present
• Start general report with:
  total patient load, any admissions, discharges, anything special: DNR, PR etc.
• Patients’ name, diagnosis, admission reasons
• The rest: hypocount, parameters, CVL line, its flushing and dressing is self explanatory
Appendix 3: One-on-one verbal handover workflow
Appendix 4: Clipboard

National University Hospital Ward 86 handover process: charge nurse sheet

<table>
<thead>
<tr>
<th>Bed No</th>
<th>Name</th>
<th>Diagnosis</th>
<th>Reason for admission</th>
<th>Others</th>
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Appendix 5: Physical check pictorial cue card
Appendix 6: Handover outcome stream map

PRE

General Handover  One to one handover  Check of Patient
Avg = 141 mins/15 staff  Avg = 515 mins/15 staff  Total Time Taken =
= 9.4 mins/staff  = 34.33 mins/staff  43.73 mins per staff

POS

General Handover  One to One handover  Physical Check
Avg = 93 mins/15 staff  Avg = 238 mins/15 staff  Total Time Taken =
= 6.3 mins/staff  = 15.86 mins/staff  22.16 mins per staff

Time Saved = (43.73 – 22.16) = 21.67 mins/per staff/PM shift
= 21.67 x 8 staff = 173.4 mins

S Saved
1 hour (60 mins) = $27
1 min = $27/60 = $0.45
Therefore, 8 staff = $0.45 x 8 = $3.60/min/8 staff
Therefore, $ saved = 173.4 mins x $3.60
= $624/8 staffs/PM Shift

Appendix 7: Handover three-step process

1. General handover
   • Patient allocation
   • Update of communication board
   • Inform in-coming staff of general ward updates, patient status and general conditions

2. Verbal one-on-one handover
   • Information exchange on clinical condition, tests, procedures, assisted daily living and discharge planning
   • Updates of patient’s care management

3. Physical check
   • Check patient from head to toe
   • Use cue card
   • Answer queries
Table 1: The number of samples for each criteria and the degree of compliance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Pre-audit</th>
<th>Post audit</th>
<th>X2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>#Y</td>
<td>%Y</td>
<td>N</td>
</tr>
<tr>
<td>1. Verbal (face to face) communication has occurred.</td>
<td>15</td>
<td>15</td>
<td>100%</td>
<td>15</td>
</tr>
<tr>
<td>2. Relevant history of the patient has been stated</td>
<td>15</td>
<td>12</td>
<td>80%</td>
<td>15</td>
</tr>
<tr>
<td>3. Detailed observations of the patient have been stated</td>
<td>15</td>
<td>12</td>
<td>80%</td>
<td>15</td>
</tr>
<tr>
<td>4. The handover process includes an agreed plan of care</td>
<td>15</td>
<td>7</td>
<td>47%</td>
<td>15</td>
</tr>
</tbody>
</table>

N, the total number edited; #Y, number complied with criteria; %Y percentage complied with criteria; P, probability of a significant difference.

Handover Team

Criteria legend

1. Verbal (face-to-face) communication has occurred.
2. Relevant history of the patient has been stated.
3. Detailed observations of the patient have been stated.
4. The handover process includes an agreed plan of care for the patient.

Figure 1: Pre-implementation audit
Criteria legend

1. Verbal (face-to-face) communication has occurred.
2. Relevant history of the patient has been stated.
3. Detailed observations of the patient have been stated.
4. The handover process includes an agreed plan of care for the patient.

Figure 2: Post implementation comparisons audit
Measuring the respiratory rate of patients in an adult haematology-oncology inpatient ward: an evidence-based approach to improve practice

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Abstract

Background
Vital signs are measurements of the body’s basic functions and include temperature, pulse rates, respiratory rates and blood pressure. Of these, it is reported that respiratory rates are often not recorded or measured inaccurately. It is essential for nurses to take an accurate measurement of the respiratory rate as it is an indicator of the patient’s condition and it helps identify patients who are at risk of adverse conditions, and, in palliative patients, conditions such as opioid toxicity.

Aims/objectives
This project aimed to improve the current practice of nurses in measuring respiratory rates.

Methods
This project utilised the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) programs to facilitate the process of change using an audit, feedback and re-audit cycle as a strategy to improve clinical practice. The team conducted the project in three phases and took approximately five months to complete the project. The project took place at a 32-bed haematology-oncology ward located within a 900-bed acute care hospital in Singapore.

Results
The pre-audit results showed a compliance rate of 14% in criterion 1. This criterion required the nurses to count the respiratory rate for one full minute and when the patient is at rest. The post audit results for this criterion revealed 64% in compliance, which signified a 50% improvement in compliance.

Conclusion
This project has helped to raise staff awareness on the importance of measuring respiratory rates for one full minute and the need to implement the measurement of respiratory rates according to best practice.

Keywords
evidence-based best practice, high dependency ward, measurement, respiratory rate, vital signs

Background
Vital signs are measurements of the body’s basic functions. Such vital signs would include temperature, pulse rates, respiratory rates and blood pressure. It is both necessary and crucial to measure and record them accurately as they are indicators of the patient’s well being. Routinely, during hospitalisation, nurses measure patients’ vital signs. Depending on the patient’s condition, the frequency of measuring of vital signs range from once a day to as often as hourly. The information gathered from these measurements enables nurses and/or physicians to make clinical decisions to provide prompt effective interventions whenever needed.
Although all the vital signs are critical in helping to identify a patient’s potential clinical deterioration, literature has reported that of all the vital signs, the respiratory rate is often not recorded or measured inaccurately.\textsuperscript{1,2,4,5,6,8} Respiratory rate measurement is a non-invasive assessment; however, it is crucial. It serves as an indicator of the patient’s status and helps to identify patients who are at risk of adverse conditions like cardiac arrest, sepsis or acute respiratory distress.\textsuperscript{2,4,5,6,7,8,11}

For example, in the palliative setting, the trending of the patient’s respiratory rate can help doctors or nurse practitioners in the titration of the amount of opioids needed to control pain or breathlessness to keep the patient comfortable. It allows nurses to look out for potential opioid toxicity in their patients.

Failure to record or inaccurate measurement of respiratory rates may be related to nurses’ excessive workload, nurses’ values and beliefs on the importance of vital signs measurement as well as a knowledge deficit on the correct technique of measuring respiratory rates.\textsuperscript{1,8,9} Factors that can contribute to inaccurate measurements include when and how a person counts the respiratory rate. The respiratory rate varies before and after an activity. A patient’s respiratory rate is slower at rest as compared to immediately after an activity. The respiratory rate would also be affected if the patient becomes aware of his/her own breathing being measured.\textsuperscript{11} Another associated factor contributing to inaccurate measurements is access to equipment and/or accessories which aid in counting the respiratory rate. An example is a watch with a second hand. Missing, broken, or inaccessible equipment are also issues affecting nurses’ assessments. All of these are significant in conducting proper assessments and measurements.\textsuperscript{10}

National University Hospital (NUH), an acute care tertiary hospital, provides a wide range of medical services. National University Cancer Institute, Singapore, (NCIS) is a haematology-oncology unit in NUH that provides both inpatient and outpatient services. In the inpatient ward of NCIS, the nurses measure the patient’s vital signs minimally three times a day. Through observation, there is a variation in the practice of measuring patients’ respiratory rates. The counting of the respiration rate varied from 15 seconds to one full minute. The differences in counting respiratory rates have led to inconsistencies and inaccuracies in respiratory measurement and documentation. This can then compromise the patient’s safety.

Audit question
Are the nurses using best practice in the measurement of respiratory rates? What is the best available evidence-based practice in measuring respiratory rates of adult patients?

Aim
To improve the current practice of nurses in measuring respiratory rates.

Objectives
- To educate nurses on the correct technique of measuring respiratory rates according to best practice.
- To implement best practice guidelines in measuring respiratory rates.
- To achieve 100% compliance to counting respiratory rates for one full minute.
- To monitor the compliance rate of nurses to best practice.

Ethical considerations
As this project is a quality improvement initiative and not a primary research, there was no need to seek formal ethical approval. All staff’s confidentiality and privacy were maintained throughout the audit.

Method
This project utilised JBI-PACES and GRIP to facilitate the process of change using an audit, feedback and re-audit cycle as a strategy to improve clinical practice. The team conducted the project in three phases and took approximately five months (January to June 2012) to complete the project.
Audit criteria
The audit utilised two criteria from JBI-PACES:

Criterion 1: The method of respiratory rate count involves counting for one (1) full minute and counting respiratory rate when the patient is at rest. (Grade B)

Criterion 2: Vital signs are to be documented.

Setting and sample size
The pilot project took place at a 32-bed oncology ward located within a 900-bed acute care hospital in Singapore. The ward comprised a 10-bed high-dependency unit and a 22-bed general unit. The high-dependency unit accommodates patients who undergo stem cell transplants, neutropenic and/or septic patients and patients who are clinically and haemo-dynamically unstable.

The audit was conducted on 14 registered nurses who worked in the high dependency unit and eight enrolled nurses working in the general unit. The registered nurses were selected for the audit as they were providing nursing care to critically-ill patients and through accurate measurement of respiratory rates, the patients who were at risk for adverse events would be identified. Likewise, the primary role of the enrolled nurses was monitoring of vital signs in the general unit, for which accurate measurement of respiratory rates was essential.

Phase 1: Planning (23 January to 13 April 2012)
Identification of best-available evidence
The topic of the pilot project was selected as it has been highlighted that respiratory rates are usually recorded inaccurately or not at all. Hence, there is a need to determine if nurses are measuring respiratory rates according to best practice. Relevant evidence-based audit criteria related to the topic were identified through JBI-PACES. These criteria were used to determine the current practice of measuring respiratory rates.

Establishment of the project team
The audit team, led by the nurse manager, consisted of a co-leader, two registered nurses and a senior enrolled nurse. These nurses were selected as they were of different levels and had significant clinical compliance. Apart from enthusiasm, they also displayed responsibility and accountability in their work. The main stakeholders included the Ward Senior Nurse Clinician, the Nurse Clinician and the Nurse Educator. The involvement of the senior leaders provided support in ensuring that the project was carried out smoothly. Rosters were arranged to facilitate meetings and the audits were conducted using protected time during staff overlap shifts between 2:30pm to 4:00pm. This timing coincided with the afternoon vital signs monitoring round.

Briefings were conducted with the respective audit team members and stakeholders on the purpose of the project. They were introduced to the audit criteria, setting, sample size and timeline of the project. The audit team members were briefed on their expected roles and responsibilities during the course of this project.

Baseline audit (5-25 March 2012)
The baseline audit was conducted using the audit tool adopted from JBI-PACES (Appendix 1). Over the two-week period, the audit team collected data through direct observation of the nurses during the vital signs monitoring round between 2:30pm to 4:00pm. JBI-PACES was utilised to compute the data collection.

Phase 2: Implementation of best practice (26 March to 27 May 2012)
Discussion on pre-audit results
At the end of the baseline audit period, the team leader shared the results of the pre-audit with the team members via email and short meetings. The main stakeholders were informed of the results via email. The project team members conducted five meeting sessions with all the nurses to examine the percentage compliance of the audit results. Each meeting lasted an hour. During these sessions, using Getting Research into Practice (GRIP), the nurses reflected, brainstormed and identified barriers to best practice. All nurses were fully aware that the respiratory rate should be counted when the patient is at rest. It was identified that some of the nurses tended to multi-task when doing parameters. Some of the nurses also verbalised that they were unaware that there was a significant difference in the counting respiratory rate in one full minute, for 15 seconds and for 30 seconds. Feelings of awkwardness ‘staring at’ patients when counting respiratory rates were also shared. The nurses then offered suggestions or solutions for future adherence. Action plans were developed to improve compliance to respiratory rate measurements. Using GRIP, these barriers and suggested strategies to overcome these barriers were documented as shown in Appendix II.
Implementation of best practice in the clinical area
During the implementation phase, the team members provided education sessions to small groups of nurses on the importance of best practice in respiratory rate measurements in the clinical area. In addition, the nurses also received one-on-one clinical teaching and constant reminders. This teaching included ways to take respiratory rates discreetly. The nurses were also encouraged to focus on one task at a time. For example, during vital signs monitoring rounds, after placing the blood pressure cuff and pulse oximeter on the patient, the nurse must not move away from the patient to do other tasks whilst waiting for the vital signs machine to pick up the readings. The nurse had to continue to stand by the patient and count the respiratory rate before moving on to other tasks.

Phase 3: Post implementation audit (28 May to 13 June 2012)
At the end of the implementation period, the team leader held a meeting with the team members and stakeholders to discuss how to better facilitate the audit before conducting the post implementation audit. The team members conducted the audit using the same methodology as the pre-implementation audit. Data was collected and JBI-PACES was then used to compute the data collection. The results were shared with the team members and stakeholders.

Results

Baseline audits
Appendix III shows an overview of the pre-audit results. There was a low compliance rate of 14% for criterion 1, which is the method of respiratory rate count that involves counting for one full minute and counting the respiratory rate when the patient is at rest. There was 100% compliance to criterion 2 that required all vital signs to be documented.

Post implementation audit
Appendix IV shows an overview of the post audit results. Criterion 2 remained at 100% and criterion 1 revealed a compliance rate of 64%. There was a 50% improvement in compliance for this criterion.

Discussion
The method of respiratory rate count involved counting the respiratory rare for one full minute and counting the respiratory rate when the patient is at rest.

There was an improvement in compliance for criterion 1 from 14% to 64%. Although nurses were not compliant to counting the respiratory rate for one full minute, they measured the rate when the patients were at rest. This improvement in compliance was attributed to all team members being constantly on the ground, providing support and guidance to the nurses. Through constant role modelling, one-on-one clinical teaching and reinforcement to the nurses on best practice, the nurses became more aware and started to change their practice. Leading by example, the team members used watches with a second hand to count respiratory rates. Accurate respiratory rate measurements, being one of the indicators of patients being at risk of adverse events, play a major role in patient safety.\(^2,4,5,6,7,8\) Hence, the team members worked closely with one another with a common goal in mind – to ensure that the nurses complied with best practice. As mentioned in Kalisch (2010), teamwork and commitment are related to patient safety. Teamwork amongst all the team members was also evidenced by their commitment. They helped each other to conduct the audit so that the predetermined sample size was attainable with the given timeframe.

Coincidently, there were two incidents whereby the documented respiratory rate of the two patients who were on continuous morphine infusion showed 18 to 22 breaths per minute. However, on assessment by the doctors, the respiratory rate was actually only six to seven breaths per minute and the patients had signs of morphine toxicity. This served as a trigger for the nurses to be more vigilant when assessing and measuring respiratory rates for patients under their care. It emphasised the importance of proper measurement of respiratory rates. The nurses were also encouraged to adopt the practice of checking the radial pulse on pretence while counting the respiratory rates. This partially helped to diffuse the awkwardness of ‘staring at’ patients when counting respiratory rates (Jevon, 2009).

Schulman (2008) strategised an effective way to conduct an evidence-based program. It was mentioned that it would require the tripartite of a sturdy foundation, supportive structures and attention to detail. It was also recommended by Ervin (2005) to have an Evidence-Based Model in order to familiarise staff with the benefits of evidence-based practice. The other contributor to the improvement of compliance in criterion 1 was the establishment of the Evidence Utilisation Group in NCIS. This group provided the necessary evidence-based practice training for the nurses. The clinical fellowship program training that was provided to the project leaders, together with the support given by the senior leaders, contributed to the success of the project.
Vital signs are to be documented
This criterion required the nurses to document each respiratory rate measurement in the clinical or observation chart. The results from both the pre- and post-implementation audit revealed 100% in compliance. As it had been emphasised to all nurses that improper documentation could lead to serious legal implications, recording down the respiratory rate became a natural process in nursing. The term “documented is equivalent to not done” is the guiding principle.19 Thus, the nurses were compliant to this criterion.

Challenges to implementing best practice
Evidence-based practice aims to improve patient outcomes and healthcare quality. Achieving this goal requires good leadership to ensure a healthy work environment. This factor contributes to better patient outcomes.18 Due to lack of experience in conducting an evidence-based project, the team leader and co-leader encountered difficulty in getting total buy-in from the nurses and in changing their misconceptions about evidence-based practice. Some nurses tend to associate evidence-based practice with change and added responsibilities. As mentioned in Schulman (2008), nurses generally do not like change. Many are comfortable with current practices and are not very receptive to changes.

Other challenges faced in the course of the project included having to tackle nurses’ perceptions of the importance of respiratory rates. In Hogan (2006), it stated that monitoring respiratory rates was in conjunction with oxygen therapy skills. This caused nurses to misconceive that respiratory rates are needed to monitor when a patient is on oxygen therapy. Some textbooks also mentioned there are two methods of counting a respiratory rate. It could be counting it for one full minute or counting it for 30 seconds and multiplying it by two. It was only after the two incidents of morphine toxicity and the reinforced education on best practice that the nurses became more aware of the importance of accurate assessment. The nurses are now more receptive to changes in the method of counting respiratory rates for one full minute.

Significant impact from the best practice project
This project has definitely been an enriching experience for both the leader and co-leader. It heightened their awareness of the relevance and benefits of evidence-based practice. The project team managed to translate evidence into practice. Though the project could not achieved 100% in compliance rates, it educated the nurses the importance of measuring respiratory rates according to best practice.

Sustenance
In order for this project to be more successful in the future, the project team will continue to engage the nurses in sharing sessions and discussions to reinforce best practice. This can help to increase awareness and lessen their resistance to change. To address nurses’ discomfort in counting respiratory rates without the patients feeling being ‘stared at’, the team is going to develop picture cue cards to show nurses how to count the patient’s respiratory rate without the knowledge of the patient. The team leaders and their members will continue to guide and support the nurses on the ground. All new nurses will be educated on the correct technique of measuring respiratory rates. From July to September 2012, the project team will continue with the strategies to enforce best practice. Thereafter, the audit team will conduct an audit in October 2012 to assess compliance. The project will then be extended to the rest of the nurses working in the other wards. This will be followed up with a quarterly audit until 100% in compliance rates is achieved. Thereafter, six-monthly audits will be conducted to ensure sustenance of practice.

Conclusion
This project has identified the need to continue to re-educate and reinforce to nurses the importance of counting respiratory rates for one full minute. This project has created awareness of evidence-based practice in the clinical setting. The project team firmly believes that with continuous education and reinforcement on the ground, 100% compliance in counting respiratory rates for one full minute is achievable.

Acknowledgements
The team would like to thank Dr Emily Ang and Senior Nurse Clinician Chow Ying Leng for guiding and assisting the team in this project. The project team would also like to thank the senior leaders and all the nurses of Ward 58 and 58H, NCIS, for their support.
References

Appendix 1: Respiratory rate measurement audit tool

Registered/ Nurse Name _______________________
Date of audit: ________________________ Name of auditor: _______________________

<table>
<thead>
<tr>
<th>Audit Indicator</th>
<th>JBI criterion</th>
<th>Observation</th>
<th>Validate documentation</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The method of respiratory rate count involves counting for one full minute and counting respiratory rates when the patient is at rest.</td>
<td>RN/EN is measuring respiratory rates for one full minute using a watch with a second hand. RN/EN counts respiratory rates when the patient is at rest.</td>
<td>Observation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td></td>
<td></td>
<td>Met</td>
</tr>
<tr>
<td></td>
<td>All respiratory rate counts involve counting for one full minute and counting respiratory rates when the patient is at rest.</td>
<td></td>
<td></td>
<td>Not met</td>
</tr>
<tr>
<td></td>
<td>• On admission</td>
<td></td>
<td></td>
<td>Remark</td>
</tr>
<tr>
<td></td>
<td>• At least once every shift</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Vital signs are documented.</td>
<td>RN/EN to document each respiratory rate measurement in clinical/observation chart.</td>
<td>Check clinical/observation chart for respiratory rate documentation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>All vital signs (respiratory rates) are documented.</td>
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</table>
### Appendix 2: Getting research into practice (GRIP)

<table>
<thead>
<tr>
<th>Barriers Identified</th>
<th>Strategies</th>
<th>Resources</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-tasking</td>
<td>To highlight and reinforce to nurses not to multi-task.</td>
<td>- Dayroom\n- Trainers\n- Pen/paper</td>
<td>50% increase in compliance rate for criterion 1</td>
</tr>
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<td></td>
<td>To engage other nurses to work as a team to achieve minimal interruptions during parameter rounds.</td>
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<tr>
<td>Unaware of significant difference in counting respiratory rates for one full minute, a 15-second count period and a 30-second count period.</td>
<td>Sharing of recommended best practice to reinforce the need for accuracy to ensure patient’s safety.</td>
<td></td>
<td>100% compliance rate for criterion 2</td>
</tr>
<tr>
<td>Nurses verbalise discomfort/awkwardness standing by patients whilst counting respiratory rates.</td>
<td>Sharing of discreet ways of counting respiratory rates to ease discomfort.\nContinue to engage nurses in discussion.\nProvide support and one-on-one coaching to ensure nurses are practising the correct technique in respiratory rate measurement.</td>
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<td></td>
</tr>
</tbody>
</table>

### Appendix 3: Pre-audit results

**Vital Signs**

**Respiratory Team**

![Respiratory Team Compliance Chart]

**Criteria Legend**

1. The method of respiratory rate count involves counting for one full minute and counting respiratory rate when the patient is at rest. (22 of 22 samples taken)
2. Vital signs are documented. (22 of 22 samples taken)
Appendix 4: Post audit results

**Vital Signs**

Respiratory Team

Criteria Legend

1. The method of respiratory rate count involves counting for one full minute and counting respiratory rate when the patient is at rest. (22 of 22 samples taken)

2. Vital signs are documented. (22 of 22 samples taken)
Improving safe practices in administering intravenous chemotherapy medication in outpatient oncology setting: a pilot implementation project

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Abstract

Background:
Medication errors in chemotherapy administration can lead to lethal, irreversible and devastating consequences to patients’ lives, and negatively impact on nurses’ confidence and jobs. Therefore, ensuring safety and quality care during administration of chemotherapy medication is of paramount importance in clinical practice.

Aim
The overall aim of this pilot project is to improve the current clinical practice by engaging registered nurses in error prevention behaviours in the administration of chemotherapy medication.

Method
The methods used in this project were in accordance with the process embedded within the Joanna Briggs’s Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) programs. It was conducted using audit, feedback and re-audit cycles to develop an action plan to improve clinical practice. The project was implemented from July to November 2012 in three phases, involving a sample size of 17 registered nurses.

Results
In criterion 1, there was an improvement of 12% in documentation in relation to the date and time the medication was administered. For criterion 2, there was a significant improvement of 70% in documentation in relation to the name and dosage of the medication. For criteria 3, there was a consistent 100% compliance rate on documentation of the route of the administration.

Conclusion
This pilot project has proved that best-available evidence on nurses’ medication administration can be implemented in the clinical area to improve nursing practice. Implementing the change was a challenging yet fulfilling process.

Keywords
adult cancer patients, chemotherapy administration, medication error, outpatient chemotherapy, safe medication practice

Background
Cancer chemotherapy is the treatment of choice for malignancies of the hematopoietic system and systemic therapy for solid tumors with metastasis. Chemotherapy is top on the list of high alert medications because of its high toxicity and small therapeutic index, and it has numerous adverse effects as compared to other medications. The uniqueness of chemotherapy medication dosage depends on the calculation of an individual body surface.
With advancements in medicine, the outpatient setting has become a common and convenient setting for the administration of most chemotherapy medication. As new chemotherapy drugs become more complex with new regimes, the risk of registered nurses performing medication errors increases thus compromising the patient’s safety.\(^5\)\(^6\) Medication error refers to error in the medication process from the start of ordering to the post administration phase.\(^7\) This error can occur at any step in the medication process when there is lack of clarity in understanding of the chemotherapy chart.\(^5\)\(^7\) The common reported chemotherapy medication errors are: administration of the wrong dose, schedule and timing error, use of wrong medication, infusion rate error, omission of medication, improper medication preparation, route error, and administration to wrong patients and administration when blood values are not within the desired range. In addition, contributory factors of errors are due to understaffing, lack of experience in administering chemotherapy, stress, fatigue, illegible handwriting, inaccessibility to medication information, increasing number of complicated schedules and new drug combination. These medication errors in chemotherapy administration can lead to lethal, irreversible and devastating consequences to patients’ lives, and negatively impact on nurses’ confidence and jobs.\(^6\)\(^8\) Therefore, ensuring safety and quality care during administration of chemotherapy medication is of paramount importance in clinical practice.\(^3\)\(^8\)

Literature has reported that registered nurses (RNs), prior to administering chemotherapy medication, has to verify two patient identifiers, drug dose, drug volume, rate of administration, expiry date and time, appearance of the medication, and blood tests within an acceptable range. In addition, registered nurses have to ensure that there is clear documentation to indicate verification has been done.\(^9\) It improves the safety of the chemotherapy process, enhances nurses’ efficiency and minimises the risk of occurrence from medication error.\(^6\)\(^8\)\(^9\)

The Cancer Centre at National University Cancer Institute, Singapore (NCIS) is an adult outpatient setting that provides chemotherapy treatment to an average of 60 haematology-oncology patients on a daily basis. To reduce the risk of medication error, it is essential for RNs administering chemotherapy medication to be competent, skilful and knowledgeable on medication. With competency, the RNs are able to make informed decisions on the safe and appropriate treatment rendered to their patients.\(^3\) Therefore, imparting knowledge and engaging RNs to support a culture of safety in their duty of care will prevent errors in chemotherapy administration.\(^2\)\(^10\)

Currently, there are no reported cases of chemotherapy medication error in the centre based on the monthly key performance indicator (KPI). However, observation has shown that there have been variations concerning safety practices in administering chemotherapy by the RNs in comparison to current best-available practice. The team has decided to take a proactive approach to safeguard practices of the RNs who as the final contact with patients in medication administration, are often held responsible for medication errors.\(^5\)\(^6\) With this approach the team would like to maintain zero incidence of medication error in the Cancer Centre.

Audit question
To what extent are registered nurses engaging in best-available evidence for safe administration of intravenous chemotherapy medication for our cancer patients?

Aim
The overall aim of this pilot project is to improve the current clinical practice by engaging registered nurses in error prevention behaviours prior to the administration of chemotherapy medication.

Specific objectives
The objectives are to:

- To educate the registered nurses on safe practices prior to chemotherapy administration
- To engage the registered nurses in safety practices prior to chemotherapy administration
- To monitor compliance in accordance to the best-available evidence.

Methods
The methods used in this project were in accordance with the process embedded within JBI-PACES and GRIP.\(^11\)

It was conducted using audit, feedback and re-audit cycles to develop an action plan to improve clinical practice. It was implemented over five months, from July to the last week of November 2012 in three phases, as shown in the Gantt Chart (refer Appendix 1).
Ethical consideration
As this is a quality improvement project, no ethical approval was required. The team followed ethical principles of confidentiality and anonymity, maintaining all patients’ and healthcare providers’ confidentiality and privacy at all times.

Phase 1: Preparation for audit
The first phase comprised activities, which include identification of topic, establishment of the project team, and identification of setting and sample.

Identification of topic
The topic identified for the audit was improving safe practices of intravenous chemotherapy administration process among registered nurses in outpatient oncology setting. The team selected the topic because there were variances in the clinical practice in comparison to best-available evidence.

Establishment and support for the audit team
The project team comprised a leader, co-leader, two senior staff nurses and a staff nurse. The team leader approached these nurses to undertake the project because of their roles and responsibilities in administering chemotherapy medication. The team leader shared with team members and stakeholders details of the project in a meeting held before the implementation of the project. This included aims and significance of the project, aspects of audit, process, criteria and the period of the pilot project. The team leader utilised this meeting to facilitate clear communication with all stakeholders and team members, with the goal of continuous support and seamless flow in conducting the project. The key stakeholders gave valuable advice to ensure progress of the project. The team met fortnightly to discuss the implementation of the project.

Identification of setting and sample
This project was held at the outpatient Cancer Centre, in an acute teaching hospital at National University Cancer Institute, Singapore (NCIS). The sample size was a population of 17 registered nurses administering chemotherapy medication in the treatment area of the outpatient Cancer Centre.

Selection of audit criteria using JBI-PACES
The team searched through the JBI-PACES program. The audit utilised the three criteria from JBI-PACES.11
Criterion 1: The date and time the medication was administered is documented.
This criterion was considered met if there is documented evidence of the date and time the medication administered in the medication chart.
Criterion 2: The name and dosage of the medication is documented.
This criterion was considered met if there is documented evidence of the name and dosage of the medication in the medication chart.
Criterion 3: The route of the administration is documented.
This criterion was considered met if there is documented evidence of the correct route of medication administered in the medication chart.

Design of audit tools
The team developed the content of the audit tool with advice from the stakeholders prior to audit implementation.

Conduct the baseline audit
The team carried out the baseline audit on the 17 RNs working in the chemotherapy treatment areas in the outpatient cancer centre. Members were briefed on the use of audit tools and clarification of doubts answered by the leaders. The team conducted the audit for a period of two weeks on the forth week of July. The co-leader keyed in the baseline audit results using the online JBI-PACES program. The baseline audit results were presented to all stakeholders, team members and the RNs through individual and small group sessions of informal discussion and presentation. The team leader and the co-leader facilitated the session using GRIP to identify the barriers and strategies with the registered nurses.
GRIP strategies
The team identified three barriers and developed strategies in the criteria related to medication administration (Table 1). The team and RNs came up with the following strategies to overcome each barrier.
Barrier 1:
• RN assumed another RN would document the end time.
Strategy to overcome barrier:
• Educate and reinforce to RNs the importance of accurate documentation.
Barrier 2:
• Knowledge deficit on the documentation of a chemotherapy order chart.
Strategy to overcome barrier:
• Create a sample of complete chemotherapy order chart.
• Conduct sharing and education sessions.
Barrier 3:
• RN is inconsistent in safe checking of chemotherapy medication prior to administration.
Strategy to overcome barrier:
• Conduct sharing sessions and re-educate RNs.
• Role modeling by preceptors.

Phase 2: Implementation
The team implemented the best-available evidence over eight weeks from September 2012 to October 2012. The leader standardised documentation practice using a sample of a complete chemotherapy order chart (Figure 2) to maintain consistency in documenting. There was involvement with the medication and documentation champions to achieve optimal outcomes.

When nurses are equipped with more knowledge, the tendency to make an error is less.5,12 Thus sharing and open discussions were conducted in an informal, individual to small group education sessions over 30 minutes using PowerPoint slides and paper materials. During the education session, the team utilised samples of complete chemotherapy order charts to teach the RNs on the correct way of documentation. In addition, after the education sessions, the team provided continuous reinforcement to the RNs in the clinical area to ensure consistency in documentation.

Phase 3: Post implementation audit
In this phase, the team leader briefed the audit team on the audit process. The team conducted the post implementation audit (Figure 2) over a period of two weeks from 15 to 29 Oct 2012. The audit team utilised the same methodology as in the baseline audit to conduct the post implementation audit. The team leader collated and analysed the baseline audit and post audit results using the online JBI-PACES program.

Results

Baseline audit result
Figure 1 shows the baseline audit results. The results of the baseline audit reflected poor compliance to medication administration for criterion 1 and 2 except for criterion 3. Thirteen out of 17 RNs (76%) showed compliance on ‘the date and time the medication was administered is documented’ (criterion 1), 1 out of 17 RNs (6%) showed compliance on ‘the name and dosage of the medication is documented’ (criterion 2), 17 out of 17 RNs (100%) showed compliance on ‘the route of the administration is documented’ (criterion 3).

Post implementation audit result
From the post implementation results shown in Figure 2, there was an improvement for all criteria. The compliance rate for three criteria increased with positive improvement in compliance to the best available practice. The date and time the medication was administered is documented (criterion 1) has improved from 76% (baseline) to 88% (post implementation) compliance rate. The name and dosage of the medication is documented (criterion 2) has improved from 6% (baseline) to 76% (post implementation) compliance rate. The route of the administration is documented (criterion 3) remained a consistent 100% compliance rate.
Discussion

Implication of clinical practice

From the results, the project showed improvement in compliance rates and achieved positive outcomes for the implementation of best-available evidence in medication administration. For criterion 1, there was an improvement of 12% (from 76% to 88%) on documentation of the date and time the medication administered. Education and reinforcement to RNs on the importance of accurate documentation was beneficial. Documentation of the end time in the medication chart clearly indicated that medication had completed at the stated time. Evidence in documentation has enhanced medication safety and minimised the risk of occurrence from medication error.6,8,9 Hence, good practice in documentation prevented the risk of concurrent, omission or a double dose of medication.

For criterion 2, there was a significant improvement of 70% (from 6% to 76%) in the documentation on the name and dosage of the medication administered. This improvement was attributed to the development of a completed sample of chemotherapy medication chart, enhanced RN’s awareness and knowledge on the importance of checking and documentation.13 The chart, which was placed in a documentation file, was easily accessible and the RNs could utilise it for future reference if they are in doubt.14

In addition, the sharing and education sessions conducted during the implementation phase increased the awareness on the importance of ‘There And Then (TAT)’ documentation, as chemotherapy medication chart is an official legal document. The education sessions not only increased the knowledge of RNs but also boosted the RNs’ confidence level in performing correct documentation. Role modeling by preceptors also inspired and influenced the RNs in the clinical area. The notion of role modeling is seen as a traditional expectation of less experienced nurses learning from more experienced ones.16,17

For criterion 3, there was a consistent 100% compliance rate on the route of the administration is documented. Although, there was no strategy needed, further monitoring would be required for any non-compliance.

Constant reminders and frequent communication by the team to the RNs at the clinical area helped in the improvement of all compliance rates. The RNs were empowered to implement best-available evidence and motivated to carry out a change in their clinical area, thus delivering patient care with greater effectiveness.18 Positive reinforcement by the leader and the co-leader through the expression of appreciation for work well done is a way to validate nurses and acknowledge their value to the organisation and reinforced their sense of self-worth.

Success

The success factors of the projected were due to the continuous reinforcement from the team in the clinical area. RNs were accountable in their duty of care for patients,7,10 hence they took ownership to improve medication safety. There was collaboration between clinic and treatment nurses to ensure medication safety. In addition, there was participation and support of stakeholders throughout the course of the project. The team was glad that they received positive feedback from RNs.

Challenges

The challenges faced by the team occurred during the implementation phase. Due to the two-shift work of the RNs, the team had to tailor the sharing and teaching sessions to the RNs’ rosters and availability, which was time consuming. Another challenge faced was that the team had to find time to teach the new RNs recruited in the department after the implementation period.
Sustaining the outcomes
Sustaining the compliance to best-available evidence is an ongoing challenge. The team will conduct quarterly audits for the coming year, followed by six-monthly audits to verify compliance. The team leader will update the RNs and stakeholders on the compliance rate after every audit. For long term sustenance plan, RNs who achieved 100% compliance for subsequent audits in safe medication administration will be recognised for their good performance in their yearly work performance appraisals. RNs, who are highly motivated, well informed and committed to organisational goals, will deliver patient care with greater effectiveness. Likewise, RNs who do not perform to the stated criteria will be constantly reminded and reinforced on the importance of safe medication administration. The team planned to collaborate with the documentation and medication team champions to standardise the practice. They could serve as role models to influence new RNs in the clinical area and at the same time provide new updates to the team on the compliance rates of the practice. Lastly, continuous support and assistance provided by stakeholders are essential for the sustenance of the project.

Limitation
The limitation of this project was the short time frame to implement this project and the small sample size.

Conclusion
This pilot project has proved that it is possible to translate best-available evidence in the clinical area to improve nursing practices. One of the outcomes of this project was consistency in documentation of medication administration. Implementing the change was a challenging yet fulfilling experience with teamwork and open communication maintained in the process. Continuous improvement of safe and quality patient is achievable if nurses ensure medication safety in the process of medication administration. Finally, the commitment of team members and RNs was crucial in the success of the pilot project.

Acknowledgments
The authors would like to acknowledge Dr Emily Ang (Head of Oncology Nursing, NCIS) and Senior Nurse Clinician Chow Ying Leng for their advice and guidance on the Evidence-based Clinical Fellowship Program. In addition, the authors would like to thank the team members for their contribution, Senior Nurse Manager Zarinah Hairom, Nurse Clinician Mary Chong and Nurse Manager Mariana Ibrahim who were the stakeholders for this project.
References

### Appendix I: Gantt chart

<table>
<thead>
<tr>
<th>Months (Year 2012)</th>
<th>July</th>
<th>August</th>
<th>Sep</th>
<th>October</th>
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<td>Week</td>
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<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<td>Stage 1-JBI Fellowship Training Program</td>
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<td>Prepare Audit Tools</td>
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<td>Baseline Audit Period (phase 2)</td>
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<tr>
<td>Generate report and arrange meeting with team</td>
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<td>Analyse result using GRIP</td>
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<td>Implement action plan and meet project team</td>
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<td>Conduct education programme to all RNs</td>
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<td>Implementation Period (phase 2)</td>
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<td>Coach and reinforce to RNs in clinical area</td>
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<td>Coach ANs on sample of chemotherapy chart</td>
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<tr>
<td>Brief audit team</td>
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**Notes:**
- The Gantt chart outlines the project timeline and activities for JBI Fellows Monographs 2012.
- The chart is divided into stages: Preparation Period (phase 1), Baseline Audit Period (phase 2), and Implementation Period (phase 2).
- Each stage includes specific tasks and timelines for July, August, September, October, November, and December of 2012.
Criteria legend

1. The date and time the medication was administered is documented (17 of 17 samples taken).
2. The name and dosage of the medication is documented (17 of 17 samples taken).
3. The route of administration is documented (17 of 17 samples taken).

Figure 1: Baseline audit result

Criteria legend

1. The date and time the medication was administered is documented.
2. The name and dosage of the medication is documented.
3. The route of administration is documented.

Figure 2: Baseline audit and post implementation result
Figure 3: Sample of a complete chemotherapy order chart

Table 1: Summary of barriers and strategies on medication administration

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Strategies</th>
<th>Resources</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN assumes another RN will document end time</td>
<td>Educate and reinforce to RNs the importance of accurate documentation</td>
<td>Documentation team champion</td>
<td>Documentation team champion reported compliance</td>
</tr>
<tr>
<td>Knowledge deficit on the documentation of a chemotherapy order chart.</td>
<td>Sample of complete chemotherapy order chart</td>
<td>Sample of complete chemotherapy order chart in file</td>
<td>Sample of chemotherapy order chart developed and placed in documentation file</td>
</tr>
<tr>
<td></td>
<td>Conduct sharing/education session</td>
<td>Charge nurse, medication team champion, EBN members</td>
<td>Charge nurse, medication and documentation team champion, EBN members reported compliance</td>
</tr>
<tr>
<td>RN is inconsistent in safe checking of chemotherapy medication prior to administration.</td>
<td>Conduct sharing sessions and re-educate the RNs</td>
<td>Charge nurse, medication and documentation team champion, EBN members</td>
<td>Charge nurse, medication and documentation team champion, EBN members reported compliance</td>
</tr>
<tr>
<td></td>
<td>Role modeling by preceptors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Measurement of temperature using tympanic thermometers in adult patients with cancer: a best practice implementation project.

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Abstract

Background
Temperature measurement is a valuable diagnostic tool and must be carried out properly for temperature changes to be detected. It is one of the most frequently performed nursing tasks carried out in hospital inpatient and outpatient settings to identify pathology and monitor changes in patient condition.

Aims/objectives
The aim of this project was to implement best practice in temperature measurement using tympanic thermometers for nurses working in an ambulatory clinic.

Methods
The project comprised three stages. The first stage involved reviewing the recommendations in literature and guidelines on the best evidence regarding tympanic thermometers for temperature measurement. The second stage involved the incorporation of changed practices into the clinical setting. The final stage was to observe and evaluate the impact of the new practice on patients and nurses.

Results
The first audit on the new practice was conducted four weeks after the practice change was implemented. Criterion 2, checking the ear canal for cerumen, showed only a 33% compliance rate. Both criterion 1 and 3, vital signs are documented and ear canal is used for measurement of temperature, reported a 100% of compliance rate. In the second audit the compliance rate was 100% for all three criteria.

Conclusion
The implementation of change in the practice of using tympanic thermometers at the Cancer Centre ambulatory clinic has proven to be successful. With these good results the team is more confident in spreading this new practice to all registered nurses and enrolled nurses working at Cancer Centre, from July to end September 2012, using the same methods and audit checklist.

Keywords
Adult patients, ambulatory clinic, ear canal, temperature measurement, tympanic thermometer
Background

Temperature measurement is a valuable diagnostic tool and must be carried out properly for temperature changes to be detected. It is one of the most frequently performed nursing tasks carried out in hospital inpatient and outpatient settings to identify pathology and monitor changes in patient condition.\textsuperscript{1,2,3,4,5,6,9} Nurses need to be knowledgeable and experienced in the use of the selected measurement tools for accurate determination of body temperature. It is necessary to support the patient’s treatment decisions especially for patients with cancer.\textsuperscript{3,4,5,7,11} The presence of fever is usually an indication of an infection, and it is common in many disease processes, particularly in the neutropenic patients, and critically-ill patients.\textsuperscript{6} A reliable and accurate temperature measurement is an important process in assessing health as well as illness, and often constitutes the basis for deciding whether to send the patient home or to administer prompt treatment.\textsuperscript{2,3,5,6,10}

Although accurate temperature measurement is an essential component of patient care, the speed and method of temperature measurement are an issue to be considered especially in a busy outpatient setting. There were a few incidences where inaccuracies in temperature reading were due to wrong placement or uncooperative patients who were unable to hold oral or axilla digital thermometers in place. In Giantin 2008, studies revealed the possibility of wrong recordings of temperature measurement due to the misplacement of the thermometer bulb, which reduces muscle mass or skin folds. While in older patients with different levels of disability and cognitive impairments, thermometer misplacement often give rise to significant errors where temperature measurements may have been measured without the nurse’s assistance.\textsuperscript{3,4}

In Mark 2000, studies confirmed that the tympanic route has become a preferred method because it is clean, quick, and painless, and generally easy for nurses to use. Although oral thermometers have been accepted as the most accurate for years, they have their degree of inaccuracy, based on technique, time, or the patient’s oral status. Tympanic thermometers eliminate this problem because they are not subject to such variability due to a patient’s oral consumption of cold or hot foods, smoking, or mouth breathing.

However, many research articles show concerns about the performance and reliability of tympanic thermometers,\textsuperscript{2,3,4,5,6,12} and there has also been considerable research evaluating tympanic temperature measurement techniques that demonstrate that an ear tug and straightening of the external auditory canal should be performed during the measurement of tympanic temperatures.\textsuperscript{5,9} The tug technique as mentioned in Porritt 2011 studies, ie pulling the pinna (auricle of ear) in an upward and backward direction, has been revealed as an evidence-based practice in adults. An ear tug, involving straightening the ear canal and ensuring it is clear of cerumen, facilitates accurate readings.\textsuperscript{4,5,9,10}

All patients who visit the outpatient Cancer Centre at the National University Cancer Institute Singapore (NCIS) have their temperature measured before seeing the doctor. Accurate measurement of temperature for these patients is important because treatment decisions are often based on temperature readings. However these patients usually need to wait between 30 to 45 minutes for their temperature measurement prior to consultation. In addition there have been a few incidences where inaccuracy of temperature reading were reported due to wrong placement or uncooperative patients who were unable to hold the oral or axilla digital thermometer in place. These incidences had raised concerns amongst the nurses, clinic executives, nurse managers and doctors.

After few meetings and discussions, a change from the oral digital thermometer to the tympanic thermometer was agreed upon. The rationale for shifting to the tympanic thermometer was made based on best practice from Joanna Briggs Institute.

Aim

The aim of this project was to implement the best practice in temperature measurement using tympanic thermometers for nurses working in an ambulatory clinic.

Objectives of this project were:

- To utilise the audit process embedded within the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) programs to implement change
- To educate nurses in the use of tympanic thermometers for measurement of temperature
- To achieve 100% compliance in nurses performing correct techniques in using tympanic thermometers for measurement of temperature
Ethical considerations
Formal ethical approval was not required in this project as this initiative was in alignment with improving patient safety and the JCI's patient safety goal. All nurses audited were assured that their confidentiality and privacy would be maintained.

Method
The project comprised three stages. The first stage involved reviewing the recommendations in literature and guidelines on the best evidence regarding tympanic thermometers for temperature measurement. The second stage involved the incorporation of changed practices into the clinical setting. The final stage was to observe and evaluate the impact of the new practice on patients and nurses.

Phase 1: Preparation period: (second week Jan 2012 - second week Feb 2012)
Identifying the topic
The topic identified was ‘using tympanic thermometers to measure temperature for adult patients with cancer’. The topic was selected for the following reasons: to improve the patient’s comfort and to reduce the patient’s waiting time for vital signs.

Establishment of the team
The project team comprised a Nurse Manager and a senior registered nurse. The project leader is the Nurse Manager and the senior registered nurse is the co-leader. Both nurses have attended the Joanna Briggs Institute (JBI) clinical fellowship program.

Setting and sample
The project was conducted in the outpatient Cancer Centre at the National University Cancer Institute Singapore (NCIS) with a sample size of six enrolled nurses. The small sample size was chosen to assist in close supervision of the new practice.

Evidence review
The team researched the best-available evidence through JBI on the use of tympanic thermometers to measure the patient’s temperature. The confirmation for using tympanic thermometers was made after the following evidence was found:

- Advantages of using tympanic thermometers include the relative ease, accuracy and safety of tympanic measurement (Level IV).
- An ear tug to straighten the ear canal and ensuring the canal is clear of cerumen facilitate accurate readings (Level 1).
- Environmental temperature and focalised heating or cooling of a patient will also have an effect on tympanic temperature measurement (Level 1).

The team conducted a cost and effect analysis to further confirm the benefits of using the tympanic thermometer and presented it to the main stakeholder, the senior nurse manager of the department. With the stakeholder’s approval, the team leader purchased tympanic thermometers through the hospital material management department. Meetings were held with the team to develop Gantt charts to set timelines for the project. The team also designed education programs and teaching materials to facilitate their teaching on using the tympanic thermometer. A skills competency checklist was designed to assess the enrolled nurses’ competency in using the tympanic thermometer (Appendix 1).

The team met fortnightly and communicated via email to ensure seamless and consistent updates on the project. The project utilised three of Joanna Briggs’s vital signs audit criteria. This was a direct observational audit where criteria were considered met if the enrolled nurses performed the new practice according to the stated criteria.
Criterion 1:
The ear canal is used for measurement of temperature.

Criterion 2:
The ear canal has been checked for cerumen and any cerumen is removed prior to measurement.

Criterion 3:
Vital signs are documented.

Phase 2: Implementation (third week Feb 2012 to second week May 2012)
The team started the implementation by conducting two education workshops for the six enrolled nurses working at ambulatory Cancer Centre. Each workshop comprised of three enrolled nurses and it lasted for 45 minutes. The workshop consisted of a short PowerPoint presentation which included a hands-on component. The aim of the hands-on session was to educate the nurses on the correct techniques of temperature measurement, the dos and don’ts, and care of tympanic thermometers. The team leader introduced the project to members covering the importance of the audit, audit criteria, compliance to be fulfilled, timeline, and the process of audit. An audit checklist was developed to monitor nurses’ adherence to correct techniques of using tympanic thermometers.

The first post implementation audit on the new practice was conducted after four weeks of implementation to evaluate the compliance of the new process where the ear canal is used for temperature measurement. During the audit, every enrolled nurse was assessed using the tympanic thermometer audit checklist. Data was collected through observation in the parameter room.

The first post implementation audit results were critically analysed using JBI-PACES and GRIP. The audit report was presented and shared to the stakeholder and the enrolled nurses. Open communication was encouraged and maintained at all times. Constructive feedback was presented, identifying positive aspects and areas that needed improvement. Strategies to overcome the barriers were suggested by the nurses. Action plans were developed through GRIP.

Barriers
Barriers for not achieving full compliance in the first implementation audit included the following: patients felt uncomfortable when their ear was being tugged, forceful placement of thermometers into the ear canal and patients’ hair wigs being shifted aside to expose ear canal during temperature measurement. Another barrier was that the enrolled nurses were unfamiliar with and unclear about the correct procedures for temperature measurement.

Strategy
The enrolled nurses were re-educated on the importance of explaining to patients before temperature taking and to be gentle when inserting the thermometer into the ear canal. They will need to assist patients in adjusting their hair wigs after temperature taking. To overcome the second barrier, a repeat practical hands-on and demonstration workshop was conducted for the enrolled nurses. Clinical coaching was provided after the workshop. A recipe card (Appendix 2) was developed to assist the enrolled nurses to understand the step-by-step procedure in using a tympanic thermometer to measure a patient’s temperature.

Phase 3: Post implementation (third week May 2012 to first week June 2012)
The second post implementation audit was conducted on the forth and fifth week of May. The audit criteria and mode of assessment remained unchanged from the first initial audit. The second post implementation audit results were critically analysed using the JBI-PACES and GRIP.

Results

First post implementation audit
Figure 1 shows the first post implementation audit results. The results reported that for criterion 2, checking the ear canal for cerumen and removing any cerumen prior to measurement, showed only a 33% compliance rate. Both criterion 1 and 3, vital signs are documented and ear canal is used for measurement of temperature, reported a 100% compliance rate.
Second post implementation audit

Figure 2 shows the results of the first and second post implementation audit results. The compliance rate for criterion 2 increased, demonstrating a positive improvement in compliance to the best practice. The compliance rate for criterion 2 improved from 33% to 100%. This represents a significant improvement of 67%. There is no difference in the compliance rate for criterion 1 and 3 between first and second implementation audit. Both criteria achieved 100% in compliance in the first and second implementation audit.

Discussion

From the results, the implementation of the practice change using tympanic thermometers in the Cancer Centre has proven to be successful. This project has achieved 100% of compliance rate in all three criteria. There were two interventions that contributed to the improvement in the compliance rate for criterion. The first intervention was the one-on-one coaching provided to individual enrolled nurses by the team in the parameter room. Coaching can support and assist ongoing continuous improvement in nursing practice and improve the safety of patients and the quality of care they receive.

The second intervention was the development of recipe cards that were put up on the walls of the parameter room. The enrolled nurses were very happy with the recipe cards and feedback was positive. They would always refer to the recipe card if they were in doubt about the steps for using the tympanic thermometer. The tympanic thermometer was widely accepted by patients and nursing staff at the cancer centre as it was more comfortable for the patients and eased the nurses’ workload. The consumables and equipment for using tympanic thermometers are higher; however there was a total cost saving of about 114,000 seconds of nursing time per month, which equated to approximately 31 hours. Comparing oral and tympanic temperature measurement, approximately 372 hours of nursing time could be saved at the Cancer Centre every year by using tympanic measurement. This could translate into cost savings or better manpower utilisation which suggests that the benefits outweigh any doubts regarding the benefits of tympanic measurement.

Sustenance plan

It was very gratifying to note the enthusiasm of the enrolled nurses in learning new skills and their participation in the implementation of the practice change. With these good results we are more confident in spreading this new practice to all registered nurses and enrolled nurses working in the other units of the Cancer Centre. From July and end in September 2012, the same methods and audit checklist will be introduced to the other units. Post audits will be done in October 2012. All the nurses will be audited every six months in May and December 2013. In order to achieve good compliance rates, the team leaders need to give continuous support and provide continuous coaching to nurses in clinical settings.

Conclusion

Tympanic thermometers are easier and faster to use. The project has improved leadership skills and the confidence of the team leader in spreading this practice change to all nurses working in the other units of the Cancer Centre. With continuous support and continuous coaching from the leaders, it will improve team work, team bonding, and encourage nurses to acquire new skills. It will also encourage the nurses to have a common goal of wanting to improve patient clinical outcomes.
Acknowledgements

The team would like to thank the six enrolled nurses for their full participation and enthusiasm in learning the new practice, Senior Nurse Manager Zarinah Hairom for supporting and embracing in the change, Dr Emily Ang for her guidance on the Evidence-based Clinical Leadership Fellowship Program and Nurse Clinician Chow Ying Leng for assisting us in utilising research evidence in a clinical setting.

References

Appendix 1: Skills competency checklist

### Assessing Patient's Temperature via Tympanic Thermometer

The participant demonstrates knowledge and skills to competently assessing patient's temperature via tympanic thermometer.

<table>
<thead>
<tr>
<th>Department/Centre</th>
<th>Name of participant:</th>
<th>Employee Number:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Competency Element</th>
<th>Competency Definition (Assessor must tick for each component)</th>
<th>1st attempt</th>
<th>2nd attempt</th>
<th>3rd attempt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Perform patient education</td>
<td>1.1 Explain the procedure to the patient:</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>- Rest for 10-15 mins (if patient arrived shortly) prior to temperature measurement.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Examine if patient has any ear infection.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Observe if there is any visible eumor or in patient's ear.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Perform hand hygiene with alcohol-based handrub</td>
<td>2.1 Perform hand washing or hand rub prior to temperature measurement.</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>- Don gloves if there is visible broken skin on the ear.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perform nursing assessment</td>
<td>3.1 Gather required:</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>- Tympanic thermometer.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Ear probe cover.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.2 Remove the thermometer from its base unit.</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>3.3 Push the head of the thermometer into the probe cover.</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>3.4 Place the thermometer firmly into patient's ear.</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>3.5 Press the trigger on the upper side with index finger and wait for reading.</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>3.6 Remove thermometer from the ear and discard the plastic probe cover.</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>3.7 Replace thermometer into base unit</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>3.8 Leave patient comfortable.</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>4. Analyse the reading to be documented on the appropriate form and analysed the reading if there are abnormality.</td>
<td>4.1 Chart the reading on the Outpatient Assessment Checklist</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Result</th>
<th>Assessment</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessor: Name/Designation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessor: Signature</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Competent / Not Yet Competent (Delete where applicable)*

To fill up only when participant is Not Yet Competent:

Comments (identified strengths and areas that require improvement):

Future strategy to become competent if applicable:

Name and signature of assessor/Date

Name and signature of participant/Date

*Competent - All assessment components must be met*
Appendix 2: Recipe card

Implement Action Plan

- Remove thermometer from its base
- Push the head of thermometer into the probe cover
- Place the thermometer firmly into patient’s ear. Press the trigger on the upper side with index finger and wait for reading.
- Replace thermometer into base unit
- Remove thermometer from the ear and discard the plastic probe cover
1. Ear canal has been checked for cerumen and any cerumen seen is removed prior to measurement.
2. Ear canal is used for measurement of temperature.
3. Vital signs are documented.

Figure 1: First post implementation audit results

1. Ear canal has been checked for cerumen and any cerumen seen is removed prior to measurement.
2. Ear canal is used for measurement of temperature.
3. Vital signs are documented.

Figure 2: Second post implementation audit results
Meal time assistance in acute care setting: a best practice implementation project

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Abstract

Background
Maintaining adequate nutritional intake for cancer patients is important to improve their fitness for cancer treatment and strengthen their immune system. However, direct observation and patients’ feedback reveal that this basic fundamental aspect of care is neglected. Nurses perceive this key nursing responsibility as the lowest priority and not relevant. This may be attributed to the lack of knowledge related to the importance of meal time care or failure to prioritise patients’ meal times.

Aim
The aim of this project was to improve clinical practice in rendering adequate assistance to patients during their meal times and improving nurses’ knowledge on the importance of meal time prioritisation in caring for patients with cancer.

Methods
This project used the pre- and post implementation audit strategy through the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) module to improve clinical practice. This project was conducted over three phases for five months from July to November 2012.

Results
The pre-implementation audit results for criterion 1, 2 and 4 showed low compliance of 10%, 0% and 13% respectively. Conversely, criterion 3 reported 85% of high compliance. After rescheduling timings for staff breaks and the implementation of scheduled nursing rounds prior to meal times, the post implementation audit showed compliance rates between 85% to 100% for all the three criteria.

Conclusion:
This project has led to tremendous improvements in improving nurses’ knowledge and understanding on the importance of assisting patients during meal times.

Keywords: adult patients, assistance, cancer, malnutrition, meal times

Background
Weight loss is one of the clinical signs of cancer. With treatments and clinical deterioration, studies have shown that 40% to 80% of cancer patients had suffered from malnutrition.1 The Joint Commission International (JCI)2 considers nutritional screening as one of the safety goals. National University Hospital (NUH) has implemented nutritional screening as part of its assessment, to ensure that high risk patients (such as cancer patients) are screened for risks of malnutrition at the point of admission. The screening tool is part of the nursing assessment notes. Although patients’ feeding ability is assessed by nurses, the tool does not reflect the plan of care that is required of a nurse to plan patients’ meal times. Maintaining adequate nutritional intake for cancer patients is important to improve their fitness for cancer treatment and strengthen their immune system. This is because they are often at risk of malnutrition due to disease progression and high intensity of cancer treatment.1
Nurses play an integral role in maintaining patients' nutritional intake as they spend a large amount of time with patients in the clinical area. With the many tasks and roles that a nurse has to juggle with, the basic fundamental needs of patient are often neglected. Nutritional care is one of the basic fundamentals and it is one of the key responsibilities of a nurse. However, it is often neglected, or deemed as the lowest priority in their nursing care activities. Nurses perceive nutritional care as neither important nor relevant compared to other tasks. This may be attributed to the failure of planning individualised activities for patients during meal times and is reflective of the lack of education on the importance of meal times in the organisation.

At the inpatient oncology ward of National University Cancer Institute, Singapore (NCIS), direct observations of and verbal feedback from patients and their family members revealed that they did not enjoy their meal times. Some of the issues that surfaced were the discomfort that they faced secondary to procedures such as lumbar puncture or bone marrow aspirations, prior to lunch or during lunch time. There was some negative feedback about nurses not caring about patients’ meal times. Some of the grievances received from family members included the nurses being too busy to feed or prop up patients for meals. Such feedback coincided with the Ministry of Health’s patient satisfaction survey done in 2010. The ward did not perform as per the required benchmark, with nurses receiving only 88.3% in the care and concern component. Another direct observation in the clinical area also revealed that patients were subjected to unnecessary clinical procedures prior to lunch or during lunch. This subjected them to missed meals as they would prefer to ‘recuperate’ from the invasive procedures. Food is a source of comfort for patients who are hospitalised. Hence, with the lack of physical comfort, it is indeed a challenge to maintain their nutritional intake during hospitalisation.

Thus, based on the above, the project utilised several criteria based on best-available evidence to guide nurses in implementing best practice change in assisting patients during meal times. These were implemented in a 24-bed hematology-oncology ward in an acute tertiary hospital in Singapore.

Audit question
To what extent are we engaging in best practice for assisting acute hematology-oncology patients during their meal times?

Aim
The aim of this project was to improve the clinical practice in rendering adequate assistance to patients during their meal times through the utilisation of best practice evidence.

Objectives
- To provide education for nurses on the importance of meal time care for haematology-oncology patients
- To monitor audit compliance with best practice criteria for rendering adequate assistance during meal times for haematology-oncology patients

Methods
This project used the pre- and post implementation audit strategy using Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research into Practice (GRIP) module. JBI-PACES is an online tool developed to assist healthcare professionals in conducting audits in the clinical setting. This project ran over three phases for a period of six months, from July to December 2012. The team utilised the Gantt chart as a guide (See Appendix 1).

Ethical consideration
The hospital’s policy considered this project as a quality improvement initiative. Thus, ethical approval was not required. Nevertheless, the team maintained patients’ and staff’s confidentiality and anonymity throughout the project. Patients were not identified through their name and identification tags, but with numerical values.

Phase 1: Preparation for audit
Phase 1 involved identifying an audit topic, establishment of the project team, setting up of JBI-PACES, identifying the audit criteria, project setting and sample size, followed by a baseline audit.
Identifying the audit topic
This topic was identified based on the constructive feedback from the quarterly patient satisfaction survey. A direct observation in the clinical area also revealed patients were often interrupted during meal times for clinical interventions such as bone marrow aspirations or even venepuncture. Other than the above, environmental factors (such as cluttered cardiac tables) and physical factors such as comfort were often neglected during meal times.

Identifying the setting and sample size
This project was conducted at NCIS in one of the inpatient oncology wards comprising 24 beds. The sample size included all nurses, excluding those who were on no-pay-leave, maternity leave, annual leave and the five members of the project. A total of 26 nurses were audited. The sample size also included all patients admitted to the ward due to the small bed size of the ward. The audit excluded patients who were on enteral and parenteral feeding, patients who are on End-Of-Life care and patients who had fasted due to their clinical conditions.

Establishing the project team
The team identified key stakeholders that included the Senior Nurse Manager, Senior Nurse Clinician and Nurse Educator. The identified stakeholders were selected in order to obtain the management support and buy-in to proceed with this project. one Nurse Clinician, one Nurse Manager and one Senior Staff Nurse who participated in the JBI Evidence-based Clinical Fellowship Program served as the leader and co-leaders respectively. Other members of the team included one Senior Staff Nurse, one Staff Nurse and two enrolled nurses. They were selected based on their excellence in clinical practice, positive attitude and their ability to reach and influence all other nurses.

The team leaders introduced the project to the members, highlighting the importance of the topic, and took them through the audit and compliance criteria, Gantt chart and how the audit would progress. The members and stakeholders used email to maintain open communication with one another.

Setting up JBI-PACES
The team leader formulated the details of the audit into JBI-PACES. The details included adding new criteria, names of members performing the audit, allocating team roles, setting the audit type and establishing the sample size.

Audit criteria
This project utilised four criteria from JBI-PACES:

- **Criterion 1**: Nursing staffs have ensured a pleasant eating environment is provided without clutter in overway and immediate areas
  
  Contextualised Criterion 1: There is documented evidence that nurses have ensured a pleasant environment for patients during meal times (breakfast, lunch and dinner)

- **Criterion 2**: Nursing staffs have received education on meal time care
  
  Contextualised Criterion 2: There is documented evidence that nurses have received an educational session on the importance of meal time care for haematology-oncology patients

- **Criterion 3**: Patients receive an assessment of their ability to eat on admission by nursing staff
  
  Contextualised Criterion 3: There is documented evidence of screening done related to patients’ feeding abilities upon admission.

- **Criterion 4**: Unnecessary clinical interventions are minimized during meal times
  
  Contextualised Criterion 4: There is documented evidence that nurses have ensured that patients’ meal times are protected from unnecessary clinical interventions.

However, we are not utilising the below mentioned criteria as our organisation does not possess an individualised care plan protocol for our hematology-oncology patients.

Criterion 1 in JBI: Individualised nursing care plans are in place for patients who require meal time assistance based on assessment.
Conducting a baseline audit
The team members conducted a retrospective baseline audit over two weeks, from end July to early August, to determine the extent to which the current practice in the 24-bed ward complied with the best evidence on protected meal time care in haematology-oncology patients. All the team members helped with data collection. Each member was given protected time to perform data collection in the clinical area. Data was collected between 11.30am to 12.30pm as lunch hour for our hematology-oncology patients started from 12pm. Lunch times were chosen as the key audit time, due to the existing high clinical activities in an acute care setting. The members went through the patients’ nursing assessment records to check for documented evidence on screening patients’ feeding abilities upon admission. Members also performed direct observations in the clinical area. This was to ensure that patients’ environment was clutter free and made suitable for meal times. This included the nurses ensuring that unnecessary clinical interventions were not performed on patients.

They conducted the audit three times a week for two consecutive weeks. This was to avoid the staff’s overlapping schedules and was also due to the possible low patient turnover rates. With the protected time, this ensured that the project did not compromise patient care.

Phase 2: Implementation of best practice
Use of JBI-PACES and GRIP
The leader input the baseline audit data into the online JBI-PACES\textsuperscript{9} program, and data was generated into a bar chart. The team used the JBI-GRIP\textsuperscript{9} program to identify gaps and barriers related to compliance with meal time assistance in the acute setting. GRIP involved three activities: situational analysis, action planning and action taking.\textsuperscript{7} In the situational analysis, the team identified gaps and barriers impacting on compliance to rendering adequate assistance during meal times. In action planning and action taking, the team identified measures to improve compliance with the audit criteria. The leader entered the identified gaps, barriers and measures into the GRIP module, and a data sheet was printed to facilitate the action plan. The leader presented the baseline audit results and GRIP data sheet to the stakeholders and team members.

Strategies for improving compliance for each audit
The team conducted a sharing session with the nurses, which included sharing of the pre-implementation audit results. The team identified three barriers based on the feedback given by the nurses (Table 1).

- **Barrier 1:** Shortage of manpower during patients’ meal times, especially during nurses’ lunch breaks.
  - **Strategy:** To re-schedule nurses’ lunch breaks
- **Barrier 2:** Nurses are busy with medication rounds during patients’ meal times.
  - **Strategy:** To re-design the workflow in order that nurses of the opposite team could help in preparing patients for their meal times, whilst the other nurses serve their afternoon medications.
- **Barrier 3:** Nurses are busy with patients’ toileting needs during meal times.
  - **Strategy:** Scheduled timings for nursing rounds prior to meal times.

Phase 3: Post implementation audit
The team carried out the post implementation audit at the end of Phase 2. The method used for this audit was similar to that of the baseline audit. The leader presented the results to the stakeholders and the team members through email. Results were also shared with the nurses to further motivate their efforts in embracing the change of practice.

Results

Pre-implementation audit
Figure 1 shows the pre-implementation audit result. Criterion 3 achieved 85% compliance. This is an indication of excellent compliance to best practice. Criterion 1 and 2 achieved 10% and 0% compliance respectively, indicating poor compliance to best practice.

Post implementation audit
Figure 2 shows all four criteria had achieved at least 80% compliance. There is a significant improvement in criterion 1, from 10% to 86% during the post implementation audit. With criterion 2 achieving 100% post implementation, this was a significant improvement as compared to 0% in the baseline audit. Criterion 3 achieved 100% compliance, a sustained compliance with a 15% increase. Criterion 4 showed a significant improvement from 14% to 94%.
Discussion

Overall, this project led to improvements in clinical practice based on current evidence. Moreover, it resulted in increased awareness and knowledge on the importance of protected meal times and rendering of adequate assistance during meal times for adult patients with cancer.

Criterion 1 focused on the importance of providing a clean and pleasant environment and achieved 86% compliance in the post implementation audit. This was a significant improvement from the 10% compliance rate in the baseline audit. This indicates that the scheduled nursing rounds may have helped the nurses in working within a structured time-frame. The scheduled rounds ensure that nurses are patient-focused during meal times, thus increasing their stay satisfaction. This reflects that nurses care about their well-being. The 86% achievement in compliance for criterion 1 coincides with the NCIS-Ministry of Health patient satisfaction survey which was conducted in September. The ward has recently achieved 100% on care and concern shown by the nurses as compared to 88.3% in 2010.

Criterion 2 was about nurses receiving education on meal time care. Compliance was at 0% during the baseline audit as none of the staff had received any in-service or talks about the importance of protected meal time care. Hence, the team held engagement sessions with all the nurses. 100% compliance was achieved in this criterion during the post implementation audit. This enabled the team to educate and create awareness about the importance of protected meal time care for the haematology-oncology patients in the nurses. The protected meal times have enabled them to interact with the patients. This allows social facilitation to occur amongst patients, as nurses act as a channel of socialisation and communication. The sessions have also enabled the nurses to reflect on their current practices, and thus improve on them. The achievement of 100% compliance in this criterion has led to an increase of 81% in the post implementation audit for criterion 4, from 13% to 94%.

Criterion 3 focused on the patients receiving an assessment of their ability to eat on admission by the nursing staff. Compliance was 85% during the baseline audit and 100% compliance during the post implementation audit. The nurses shared that the consistent results were due to their compliance in following the hospital's clinical practice standards. This was also inculcated into them by their clinical preceptors through role modelling upon graduation. Hence, role models play an integral and pivotal role in nurturing novice nurses towards clinical excellence.

Criterion 4 focused on ensuring that any unnecessary clinical interventions are minimised during meal times. As observed by the team members, there were not many clinical procedures such as bone marrow aspirations or lumbar punctures (common haematology-oncology procedures) planned during meal times. The nurses felt that with increased knowledge, they would be able to plan and execute patients’ clinical activities. Hence, when nurses are empowered with knowledge, they are better equipped to provide better patient care.

Success factors

Three factors contributed to the success of this project. The first factor was the empowerment of the nurses to plan and minimise any unnecessary clinical interventions through the increased knowledge and awareness on the importance of meal times. Second, the engagement sessions that were held by the team provided a sense of autonomy and ownership amongst the staff in relation to the change in practice. This collaborative governance has increased the staff’s sense of empowerment. This allowed them to embrace the change and take ownership of the project. The last success factor was related to adequate manpower during meal times, good teamwork and support from all staff including the Nurse Manager, Nurse Clinicians and Nurse Educator. Everyone embraced the change in practice.

Lesson learnt

The team felt that this project had enhanced their leadership skills, as the project involved support from the staff and the senior nursing leaders. Other than the above, the team felt that the project had allowed them to think out of the box, be flexible and yet adhere to the hospital’s guidelines.

In addition, the team analysed that the majority of the staff belonged to Generation Y. Generation Y nurses prefer to choose their own working environment. Thus, allowing the nurses to realise how beneficial the project was to their work areas, for example, decreased the amount of call-bells from patients during meal times. They were willing to take up the challenge to make changes in their practice. Hence, this allowed them a smoother transition to embracing change. The different ways and strategies used to lead Generation Y nurses have contributed to our project positively. Commitment and passion of the team members are essential for the success of any project as they are also our role models in the area of change translation.
The role-modelling agent had also influenced the rest of the nurses in embracing change. This may be attributed to role-models being the catalyst to propel and strengthen change in practices. However, the team was faced with several barriers during the implementation phase too. Patients’ acuity plays a pivotal role in ensuring that nursing manpower is utilised and dedicated towards patients’ meal time care. Hence, there were times when nurses were away or occupied with high acuity patients. This affected criterion 1, in which nurses were not be able to clear patients’ acuity plays a pivotal role in ensuring that nursing meal time care. Hence, there were times when nurses were away or occupied with high acuity patients. This affected criterion 1, in which nurses were not be able to clear several barriers during the implementation phase too. Patients’ acuity plays a pivotal role in ensuring that nursing meal time care. Hence, there were times when nurses were away or occupied with high acuity patients. This affected criterion 1, in which nurses were not be able to clear

**Sustenance plan**

Every project has barriers and strategies to overcome. The team leader plans to speak to the allied health professionals (eg physiotherapists, occupational therapists, etc) via an engagement session. The aim of this engagement session is to increase awareness of the importance of meal time care, thus rescheduling their patient contact time. Team members will also continue to monitor the compliance rate of the nurses through planned audits. The team will conduct monthly audits for the first three months, followed by a quarterly audit through the year.

Continued support through random observational audits of the stakeholders will also be beneficial in the sustenance plan. The nurses will continue with their new break-times and execute the scheduled nursing rounds as planned. The team will also include this project in the orientation package for newly joined nurses.

**Conclusion**

This project utilises the pre- and post audit strategy to translate evidence into practice. It is an indication that despite working in a busy and acute oncology settings, continuous improvements and changes in practice are still feasible through teamwork. Through this, the project has resulted in increased awareness and knowledge on the importance of protected meal times. This may not necessarily increase the patients’ nutritional intake, but the results may have contributed to the increase in patients’ satisfaction during their stay whilst the project was in progress.

**Acknowledgement**

The team would like to thank Dr Emily Ang and Senior Nurse Clinician Chow Ying Leng for being such immaculate and patient facilitators and mentors; our senior nursing leaders who rendered their support through role modelling and supervision, Senior Nurse Manager Ong Hwee Sen, Senior Nurse Clinician Lee Lay Hoon and Nurse Educator Wendy; and lastly, Senior Staff Nurse Bianca Seng, Staff Nurse Carol Ho, Enrolled Nurse Eileen and Enrolled Nurse Gennie for being part of the team in propelling the project towards implementation.

**References**


**Figure 1: Pre-implementation audit results**

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**Mealtime assistance in acute care**

![Mealtime assistance in acute care graph](image_url)

**Criteria Legend**

1. Nursing staff have ensured a pleasant eating environment is provided without clutter in overway and immediate area. (26 of 26 samples taken)
2. Nursing staff have received education on mealtime care. (26 of 26 samples taken)
3. Patients receive assessment of their ability to eat on admission by nursing staff. (26 of 26 samples taken)
4. Unnecessary clinical interventions are minimised during mealtime. (26 of 26 samples taken)
**Mealtime assistance in acute care**

![Graph showing compliance percentage over time]

**Criteria Legend**

1. Nursing staff have ensured a pleasant eating environment is provided without clutter in overway and immediate area. (26 of 26 samples taken)
2. Nursing staff have received education on mealtime care. (26 of 26 samples taken)
3. Patients receive assessment of their ability to eat on admission by nursing staff. (26 of 26 samples taken)
4. Unnecessary clinical interventions are minimised during mealtime. (26 of 26 samples taken)

Figure 2: Post implementation audit results

**Appendix 1: Gantt chart for project**

<table>
<thead>
<tr>
<th>Month</th>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>Preparation Period</td>
</tr>
<tr>
<td>Feb</td>
<td>Baseline Audit Period</td>
</tr>
<tr>
<td>Mar</td>
<td>Post Implementation Audit Period</td>
</tr>
</tbody>
</table>

![Gantt chart with tasks and dates]
Table 1: Barriers and strategies

<table>
<thead>
<tr>
<th>BARRIERS</th>
<th>STRATEGIES</th>
<th>RESOURCES</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortage of manpower during meal times, especially during lunch time</td>
<td>To re-schedule nurses’ lunch breaks</td>
<td>NM/NC/NE/Charge Nurse will ensure that nurses go for staggered breaks during their morning shifts and ensure that the clinical area is buffered</td>
<td></td>
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<tr>
<td></td>
<td>Scheduled breaks amongst nurses for morning shifts.</td>
<td></td>
<td>Ward will have at least 80% of staff strength left during patients’ meal times, especially during lunch. 80% staff present during meal times, to assist patients in feedings.</td>
</tr>
<tr>
<td></td>
<td>1st break: 10.30am-11.30am</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2nd break: 12.30pm-1.30pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RNs are busy with their medication rounds, especially during lunch time</td>
<td>To re-design the workflow in order for nurses of the opposite team to help in preparing patients for their meal time, whilst the other nurses serve their afternoon medications.</td>
<td></td>
<td>Team will ensure that nursing rounds are performed at least 80% of the time prior to meal times. Unnecessary interruptions during nurses’ medication rounds are minimised. Meal times will be conserved and patients have a pleasant eating environment through the elimination of physical and environmental un-pleasantries.</td>
</tr>
<tr>
<td></td>
<td>Scheduled timing to ensure patients are propped up.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM shift: 7.30am to 8am</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>11.30am to 12pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PM shift: 5.30pm to 6pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurses are busy with patients’ toileting needs during meal times</td>
<td>Scheduled timings for nursing rounds prior to meal times.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scheduled timing for elimination rounds.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM shift: 7.30am to 8am</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PM shift: 5.30pm to 6pm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hand hygiene compliance sustenance program among registered and enrolled nurses in a hematology-oncology unit

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Abstract

Aims: The overall aim of this project was to establish an effective multimodal approach to improve hand hygiene compliance and sustenance among oncology registered and enrolled nurses who work in inpatient and outpatient settings.

Methods: This project used the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) and Getting Research Into Practice (GRIP) program which is an online resource data tool that helps health professionals conduct audits using evidence-based criteria, implement change and audit their own results. JBI-PACES simplifies the cycle of audit, feedback and re-audit and promotes ownership of the practice change process among stakeholders. The audits utilised all criteria recommended by the WHO Guidelines on Hand Hygiene in Healthcare and took place over six months from November 2010 to May 2011. The project was conducted in the inpatient and ambulatory unit in the National University Cancer Institute involving a sample size of 130 registered and enrolled nurses. A direct observation method of monitoring hand hygiene compliance was used.

Results: The post implementation audit findings showed a slight improvement in the criteria: between one to 12% increments for each criterion.

Discussion: Focused interventions were conducted in a group setting and allowed staff to relate with one another and develop greater awareness in the area needing improvement. The group setting promoted discussion and allowed clarification on any misconceptions about hand hygiene principles. The discussion also led to agreement that one-on-one feedback and discussion about missed opportunities with the relevant staff is necessary even though the staff member had received basic hand hygiene education. The one-on-one feedback helped raise awareness of staff about their own hand hygiene practices, prompting them to reflect on any lapses in their current practices that required customised interventions to the barriers that they faced.

Conclusion: The one-on-one engagement promoted long-term sustainability in good hand hygiene practice as it was an effective approach in getting staff to engage personally and reflect on their own practice. This enabled them to increase their compliance to recommended practices.

Keywords: evidence-based practice, hematology, infection control, nursing, oncology

Background

Healthcare-associated infection (HAI) is defined by the Centers for Disease Control and Prevention (CDC) as a localised or systemic condition that results from an adverse reaction to the presence of an infectious agent(s) or its toxin(s). There must be no evidence that the infection was present or incubating at the time of admission to the acute care settings. HAIs have generally been implied to increase morbidity and mortality among patients, extend patients’ average length of stay and increase healthcare costs.

Studies have shown that factors that influence acquisition of HAIs include virulence of the organism, susceptibility of the host and the environment that the host is in. Although the acquisition of HAIs is multi-factorial, the transmission of these organisms via the hands of healthcare workers has been documented. Apart from the transfer of organisms from touching patients, contact with the patients’ surroundings can also result in hand contamination. Numerous studies have suggested the effectiveness of good hand hygiene in reducing the transmission of healthcare-related pathogens and thus HAIs.
Hand hygiene is broadly defined as the cleansing of hands with soap and water or with an antiseptic hand wash, alcohol-based hand rubs or surgical hand antisepsis. However, it has to be properly performed and at appropriate times so that the risk of cross-transmission can be effectively reduced. Proper decontamination of hands involves use of an appropriate cleansing agent, thorough cleansing of the hands (covering all surfaces of the hands) and complete drying of hands. The indications for hand hygiene can be summarised with ‘My 5 moments of hand hygiene’, which was referred by Pittet as ‘a novel concept incorporating social marketing, human factors, and the science behind cross-transmission and hand hygiene’. The concepts were established when it was realised that information and education regarding how and when hand hygiene was to be performed was inconsistent and the definitions were complicated. This concept has also been adopted in the World Health Organization (WHO) Guidelines on Hand Hygiene in Healthcare.

The WHO Guidelines on Hand Hygiene in Healthcare provide a comprehensive review of scientific data on hand hygiene rationale and practices in healthcare so as to reduce transmission of organisms to patients and healthcare workers. In the National Cancer Institute Singapore (NCIS), the recommended guidelines for hand hygiene practices are followed, and compliance is evaluated monthly using a direct observation method by intra-ward hand hygiene auditors. The need to ensure consistent good hand hygiene compliance rate remains a challenge for many organisations. Previous literature has highlighted the need for a multimodal approach to ensure successful sustenance of the program. This is due to the complexity of hand hygiene behaviour and the various external factors that affect this behaviour. The need to actively implement strategies that improve or sustain compliance to good hand hygiene practices is similarly reflected in NCIS. NCIS is the second cancer centre in Singapore and is part of the National University Health System (NUHS). It comprises the ambulatory cancer centre and inpatient wards, and is located within the National University Hospital (NUH), which is a member of the NUHS. NUH is a 991-bed acute teaching hospital and is a Joint Commission International Accredited Institution since 2004. In 2004, the Joint Commission added an international patient-safety goal that required institutions to adhere to approved hand hygiene guidelines and a system to be in place for the measurement of adherence to the guidelines. Located within NUH, NCIS adopted the hand hygiene program that NUH has in place so that the goals are aligned and interventions, more effective. NUH has strived to achieve a target compliance rate of at least 75% for general ward settings and 85% for intensive care and high-dependency care units. In the first quarter of 2011, the average compliance was 68.6%. Through an array of strategies that have already been in place since 2008, the hand hygiene compliance in NUH has been on an upward trend. However, inconsistencies in the percentage of compliance among departments have been observed. Furthermore, although an audit tool is already in place in NUH to measure the compliance of good hand hygiene practice, an in-depth dissection of the barrier/s that prevent greater compliance to good hand hygiene practice among nurses is lacking. WHO recommends understanding hand hygiene practices and the factors that prevent good practices among healthcare workers so that interventions planned will be of value.

Within NCIS, the average compliance for hand hygiene has been hovering around 68% to 72% from 2008 to 2010. Although blood stream infection (BSI) with a multi drug-resistant (MDR) organism like vancomycin-resistant enterococci (VRE), extended spectrum beta-lactamases (ESBL) and meticillin-resistant staphylococcus aureus (MRSA) has been low, it has been observed that the rate is increasing, especially for organisms such as klebsiella pneumoniae.

Due to the nature of the residing malignancies and the often resulting immunosuppression induced by the treatment, hematology-oncology patients often end up being susceptible hosts and situated in an environment that increases their risk: prolonged hospitalisation, wearing invasive devices, undergoing invasive procedures, undergoing antimicrobial therapy and being admitted into the intensive care unit. These factors have been shown to increase the risk of acquiring HAIs. The resulting effect of increasing use of antimicrobial therapy, thereby increasing cost, prolonged hospitalisation and mortality further intensifies the need for an effective and successful hand hygiene program.

Aim

In order to enhance the existing program, the overall aim of this project was to establish an effective multimodal approach to improve hand hygiene compliance and sustenance among oncology-registered and enrolled nurses working in the inpatient and ambulatory unit.

The specific aims of this project were:

1. To audit compliance with best practice established criteria for hand hygiene.
2. To utilise the audit, feedback and re-audit cycle in an established program so as to continuously compare and evaluate audit compliance and to implement strategies to target specific barriers to achieve improved sustenance in compliance.
Methods

This project used JBI-PACES and GRIP programs, which are online resource data tools that help health professionals conduct audits using evidence-based criteria, implement change and audit their own results. JBI-PACES simplifies the cycle of audit, feedback and re-audit, and promotes ownership of the practice change process as the stakeholders are responsible for planning the change action and who will be involved in this process.13 Based on WHO9 guidelines and evidence, JBI has developed audit criteria that are intended to guide effective best practices in hand hygiene so as to minimise cross-transmission of micro-organisms.18 A number of audit criteria were used in this project.

This project was implemented over a six-month period from November 2010 to May 2011, and was carried out over three phases.

Ethical considerations

Ethics approval was not sought for this project as it was considered a quality improvement project and not research. The confidentiality and anonymity of staff who were audited were kept and adhered to throughout the project.

Phase 1: Preparation for audit

Identification of topic

Hand hygiene compliance among registered and enrolled nurses working in the inpatient and ambulatory unit in NCIS was selected as the topic of choice as HAIs, especially because body substance isolation (BSIs) were on an increasing trend in the centre. Moreover, studies have suggested an inverse relationship between improved hand hygiene compliance rate and HAIs.3,8-11 The profile of the patients in the unit accentuated the need to scrutinise and break down the current barriers that prevented good hand hygiene practices.

Establishment of the project team

The members of the project team included a Nurse Manager who led the team, three Senior Staff Nurses and one Staff Nurse. All had recently completed a 10-day infection control training course organised by the Asia Pacific Society of Infection Control. The topic was chosen unanimously as the need to address infection control was a priority on everyone's minds after the course, and hand hygiene has been considered to be the single most effective measure to prevent HAIs.8,20 As all members were working in different units, each member readily took ownership of the audit process in their respective units. The project was launched following the infection control training course. The team searched for historical data for the acquisition of MDR organisms and the overall hand hygiene compliance of both NUH and NCIS via the organisation's Infection Control Department website on the intranet. An electronic database search for best practice recommendations was conducted. Based on data and information obtained, the team drafted the focus and aims, and planned the timeframe of the project.

The Head of the Oncology Nursing Unit and a Senior Nurse Clinician who had participated in the JBI Evidence-Based Clinical Fellowship program guided the members on the use of JBI-PACES and GRIP. Open communication with all team members was maintained at all times via email and phone calls. The team was given a budgeted time to convene weekly in the first two weeks of the project in order to confirm the details of the project.

Setting up JBI-PACES

A fellow nurse clinician from the hospital's Evidence-based Nursing Unit (EBNU) further guided the team on the use of JBI-PACES. Details of the audit were formulated into JBI-PACES that included setting up the audit team, adding new teams, allocating team roles, setting the audit type and determining the sample size.

Identifying audit criteria

This project utilised audit criteria generated from JBI-PACES. There were two criteria that were not found in JBI-PACES when the project commenced, with baseline audit conducted in November 2010. As there was no baseline data for comparison, the criterion ‘Hands are washed using an effective hand washing technique involving three stages’ was initially excluded from the project. The criterion ‘Staff has received education about hand hygiene’ was included as hand hygiene competency was a compulsory requirement for all staff of the organisation and thus, education was considered as being received.

The criteria and scope are as follows:

**Criterion 1:** Alcohol-based hand rub is routinely used for hand hygiene unless hands are visibly soiled.

Scope: The criterion is considered met when a staff member uses alcohol-based hand rubs for hand cleansing, unless the staff has visibly soiled or potentially contaminated their hands eg after handling patients who are experiencing vomiting and/or diarrhoea, or who are infected with clostridium difficile, an outbreak of norovirus or other diarrhoeal illnesses,, or after having had direct hand contact with bodily fluids.
In addition, alcohol-based hand rub is also contraindicated even if staff are wearing gloves but encounter the above circumstances.

**Criterion 2:** Hands are decontaminated immediately after contact with individual patient and/or all inanimate objects, including equipment.

Scope: The criterion is met when hands are decontaminated using alcohol-based hand rubs or are washed.

**Criterion 3:** Hands are decontaminated immediately before each and every episode of direct patient contact or care and/or contact with all inanimate objects, including equipment.

Scope: The criterion is met when hands are decontaminated before each and every episode of direct patient contact or care. Decontamination of hands before touching equipment is not taken into account, as according to ‘My 5 moments of hand hygiene’, the requirement for decontamination before touching equipment is not stated.

**Criterion 4:** Hands are decontaminated with an alcohol-based hand rub (unless visibly soiled) between different activities of care for the same patient.

Scope: The criterion is considered met when staff practise the principles of decontamination of hands when moving from a contaminated body site to a clean body site.

**Criterion 5:** Hands that are visibly soiled or potentially grossly contaminated with dirt or organic material are washed with liquid soap and water.

Scope: The superiority of decontamination of hands using antiseptic soap over a non-antiseptic one has not been conclusive; thus, the criterion is considered met when any kind of liquid soap and water is used during hand washing.

**Criterion 6:** Staff member has received education about hand hygiene.

Scope: For the baseline audit, all were considered to have received education for hand hygiene. In the follow-up audit, the criterion for education was indicated when re-education was undertaken. Re-education was indicated when staff were observed to have missed opportunities in meeting the criteria. This re-education entailed one-on-one engagement with the staff member in question in order to discuss missed opportunities.

**Identifying the setting and sample size**

In order to ensure a good representation of registered and enrolled nurses working in the inpatient wards and ambulatory unit, the required sample size was determined using the template in JBI-PACES. The parameters required to determine the sample size in JBI-PACES were total population of staff, current compliance to the criteria (average of 60% compliance across all criteria) and the target compliance to achieve (100%). Considering that the population size of registered and enrolled nurses was 144, JBI-PACES indicated that 77 staff had to be audited for a good representation. The team however decided to conduct the baseline audit on as many nurses as they could target within the two weeks of the audit, as the team hoped to capture the baseline hand hygiene practice of staff so as to enable more effective follow-through on staff members’ hand hygiene practices in the long run.

**Conducting baseline audit**

The baseline audit was conducted for 130 staff over a two-week period from mid-November 2010 which accounted for 90% of the total population. The remaining staff were away on leave, and there were no opportunities to conduct the baseline audit on them. All the team members had undergone the hand hygiene auditor training that was conducted by the institution’s infection control team using the training film from the WHO multimodal hand hygiene improvement strategy. The team was also given time within their working hours to conduct the audits using the direct observation method. On the first two days of data collection, the team conducted the audits from 8am to 5pm so as to maximise the population size, as the morning and evening shifts not only had the highest number of staff on duty, but also involved the highest care activities thus allowing for more hand hygiene opportunities to be observed. For subsequent days, the team members took turns conducting the audits. The audits were conducted by direct observation, which is one of the standard methods of auditing hand hygiene compliance. Staff working on the shifts were shadowed and observed for at least one patient care activity. Data was documented on the spot on hard copies of the data collection tool that were printed from JBI-PACES, and then entered into JBI-PACES again by the team leader. Staff being audited were simply instructed to proceed with their daily care and were unaware that they were being audited for hand hygiene, although most of them did realise it sat some stage during the audits.
Phase 2: Implementation of best practice

Use of GRIP to document barriers, strategies and resources required

Following the completion of the baseline audit, the results were entered into JBI-PACES and a report and graph generated. The team reconvened, and using GRIP, the baseline audit results were analysed. The three steps of GRIP, situational analysis, action planning and action taking, were used to develop an action plan. Using GRIP, barriers, namely, time pressure and the lack of knowledge among staff in recognising opportunities for hand hygiene practice, were identified and documented.

Recommended strategies in literature on improving hand hygiene compliance were compared with the strategies that the institution already had in place. We discovered that the majority of the recommendations that compiled with WHO guidelines were already in place at NUH. It has been recommended that alcohol-based hand rubs be placed in close proximity to patients to encourage usage during patient care.8,9 Hospital-wide hand hygiene competency assessments were launched, posters and small token awards for good compliance to hand hygiene were given as motivation and compliance rates for each unit were notified to the respective departments.8,23 The compliance rate reported was the overall compliance; the low compliance of specific criteria was not reported. In order to enhance the interventions that were already in place, a plan of action was developed targeting specific criteria with low compliance in the centre.

Conducting hand hygiene audits using the observation method has both advantages and disadvantages.24 One benefit is the ability to observe firsthand the way in which staff are complying with the audit criteria and barriers to the compliance. In this project, a surprise observation reported by the auditors was the poor compliance of thorough decontamination of hands. The organisation has adopted the use of ‘Six steps of hand cleansing’ to ensure that all surfaces of the hands are fully decontaminated. Only 24.6% of staff were observed to have fully decontaminated their hands when they performed hand hygiene. The observations for complete decontamination of hands were not included in the initial audit criteria. This was because an assumption was made that staff were decontaminating their hands thoroughly as they had to undergo hand hygiene competencies which included the use of the ‘Six steps of hand cleansing’ while adhering to ‘My 5 moments of hand hygiene’ as part of their job skill assessment.

The disadvantage of the observation method was the likelihood of the onset of the Hawthorne Effect, where staff, knowing they were being observed, modified their behaviour instead of following their usual practice.25 It can be implied that due to the Hawthorne Effect, the compliance rate was probably higher because staff were aware that they were being audited. However, the low compliance to the ‘Six steps of hand hygiene’ was a reason for concern, and the team decided to analyse the barriers resulting in the low compliance, although the initial plan was to exclude this criterion.

Strategies for improving compliance for each audit

A focus group of 10 members was organised in January to gain a better understanding of the barriers faced by nurses in practice. The members of the focus group were provided with several scenarios in which the highest non-compliance to hand hygiene practice had occurred, as a simulation to understand the barriers to hand hygiene practices. They were then asked to re-enact the scenarios in the classroom, and permission was sought to have the scenarios recorded. The video was then played to the group, and the members were requested to highlight the missed opportunities; they were also asked to observe if the ‘Six steps of hand hygiene’ were performed. The group was then asked to share the barriers they encountered. These included time pressure, performing multiple cross-contamination activities for the same patients and being unsure of indications to perform hand hygiene. The barriers mentioned were the common challenges that many other healthcare organisations faced.8,23

Strategies are wide ranging but often do not sustain good hand hygiene practices. The different interpretations of hand hygiene opportunities were observed as staff engaged in discussion among each other and with the project members of the focus group. This again warranted the need to re-educate the staff. There was also a strong need to create an environment where staff could be constantly reminded of the importance of good hand hygiene practices and could receive direct performance feedback pertaining to their hand hygiene practice, as some were not aware that their interpretation was inadequate. Following the focus group, the project members sought to observe the focus group members and provided performance feedback on a one-on-one basis as soon as an opportunity was missed.

An audit on the focus group participants was conducted in February to evaluate if re-education during the focus group led to increased compliance in hand hygiene practices. It was observed that there was a slight improvement in compliance for some criteria, but there were also inconsistencies in other criteria (Figure 1) This highlighted the need for prominent reminders and performance feedback to be given to staff regularly for reinforcement of messages and to encourage adherence to good hand hygiene practices.
Nevertheless, the team made the decision to roll out the re-education, as the in-service was deemed to be a suitable platform to create awareness and remind staff that proper hand hygiene practices has an impact on the prevention of HAIs not only in patients but in staff as well. The in-service was conducted in March over a one-week period. The scenarios in the WHO hand hygiene training video were used to train staff to identify correct and incorrect hand hygiene opportunities based on ‘My 5 moments of hand hygiene’. The importance of complete decontamination of hands using ‘Six steps of hand hygiene’ was once again reinforced. The aim of the in-service was for staff to relate to the scenarios and reflect on their own hand hygiene practices.

Following the in-service, a series of posters with ‘focus of the month’ themes were created and posted on walls in prominent locations throughout the wards so as to remind staff of good hand hygiene practices. The use of supportive marketing materials was found to be one of the most successful strategies in improving hand hygiene compliance as they not only served as reminders to staff, but also created awareness among the patients and caregivers. Each month when the poster was updated, the team members engaged with staff in discussions after sharing with them the theme of the month. The themes were selected based on the analysis of the data and from the focus group findings. This created a platform to allow clarification of staff members’ interpretation of good hand hygiene principles and aided in strengthening concepts shared. This was another strategy to address the barrier to good hand hygiene practices, as the failure to recognise hand hygiene opportunities during patient care and lack of awareness of the risk and methods of micro-organism cross-transmission were deemed as barriers to good hand hygiene practices.

Results

**Phase 3: Post implementation audit**

The post implementation audit was conducted in April, following a three-month implementation. Data was collected using the criteria from JBI-PACES. A total of 130 staff were audited. Staff were now observed for a minimum of five opportunities for hand hygiene. The change in the number of times a staff was to be observed was done to align the current project with the institution’s strategies. As part of its strategy to improve hand hygiene compliance, the institution requested that each clinical area conduct monthly audits on individual staff for hand hygiene compliance which was reported as overall compliance for the clinical area. The team also decided to include the criterion, ‘Hands are washed using an effective hand washing technique involving three stages’ (criterion 7). However, the scope of this criterion was to observe if staff used the ‘Six steps of hand hygiene’ for the complete decontamination of their hands, regardless of whether alcohol-based hand rubs or hand wash were used. Although no data was entered into JBI-PACES for this criterion in the baseline audit, the team had already recorded the compliance separately during the baseline audit, once it was observed that the ‘Six steps of hand hygiene’ was not commonly performed. As such, the comparison of baseline and post implementation audit was made possible. The decision to include the criterion, ‘Hands are washed using an effective hand-washing technique involving three stages’ (criterion 7), in the post implementation audit also stemmed from the team's decision to continue the use of JBI-PACES and GRIP to document the findings, as the program provided a systematic methodology in the collation, analysis and evaluation of intervention. Furthermore, the program was able to generate comparison of the data.

**Discussion**

The post implementation data showed improvements for some criteria (Figure 2):

**Criterion 1:** Alcohol-based hand rub is routinely used for hand hygiene unless hands are visibly soiled.

A 1% increase was observed in the routine usage of alcohol-based hand rubs brought the routine usage to 90%.

**Criterion 2:** Hands are decontaminated immediately after contact with individual patient and/or all inanimate objects, including equipment.

There was a 12% increase in decontamination of hands immediately after contact with an individual patient and/or all inanimate objects, including equipment.

**Criterion 4:** Hands are decontaminated with an alcohol-based hand rub (unless visibly soiled) between different activities of care for the same patient.

There was a 4% increase in decontamination of hands in between patient care activities. This result was encouraging, as it has been reported that this indication is often not recognised by healthcare workers and was not reported in the compliance data.
Criterion 5: Hands that are visibly soiled or potentially grossly contaminated with dirt or organic material are washed with liquid soap and water. This criterion needs to be further assessed in future audits, as the number of staff in the sample who met the baseline audit was too small to enable a significant comparison to be made although the compliance rate of 74% was encouraging.

Criterion 6: Staff have received education about hand hygiene. By using criterion 6 as an indicator for performance feedback, there should be a continual decrease in the percentage for this criterion as staff became well versed in the principles of good hand hygiene practices.

Criterion 7: Hands are washed using an effective hand washing technique involving three stages. The percentage of staff who performed the ‘Six steps of hand hygiene’ increased by 5.6%, from 26.4% to 32%.

Criterion 3: Hands are decontaminated immediately before each and every episode of direct patient contact or care and/or all inanimate objects, including equipment. This was the only criterion that showed a decrease of 10%. The result for criterion 3 serves as a reminder that the challenge to improve hand hygiene compliance is a long drawn one and needs strong support from all levels of staff. The team needs to be objective yet vigilant in implementing the interventions. The time frame for intervention also needs to be taken into consideration as frequent changes in strategy may lead to confusion.

Sharing results
The results of the pre- and post implementation audits were shared at each inpatient and ambulatory area using graphs. The graphs were posted on the walls of the area, detailing the percentage of compliance to good hygiene practices (5 moments, 6 steps). Following the need for monthly audits, the monthly results would be posted on the charts, and using GRIP, barriers and interventions would be recorded and generated. The charts would then serve as a visual indicator of the progress of the unit.

Conclusion and future recommendations
For behavioural changes to take place, a multi-pronged approach has to be employed.\(^8\,15\) The multimodal approach recommended by WHO includes education programs, compliance monitoring and performance feedback, formation of a multidisciplinary team and documented commitment from the staff. This multimodal approach is translated to the unit level. The monthly audit would allow compliance to be monitored. Rather than having performance feedback given at the end of the month and reported as an overall compliance, it is proposed that performance feedback regarding hand hygiene practices be given as soon as an opportunity is missed. The one-on-one feedback and engagement helps raise awareness among the staff about their own hand hygiene practices. This prompts them to reflect upon their current practice and can lead to customised interventions to the barriers faced by staff. The education program would continue with performance feedback as a regular feature. It will also be used as a forum to discuss good practices with staff and clarify any misconceptions.

In order to further encourage staff to continue making efforts to improve their hand hygiene practices and to remind their colleagues to do the same, a custom-designed pull reel with the NCIS hand hygiene logo will be provided to staff who are able to maintain a compliance rate of at least 85% for three consecutive months as a recognition of their commitment to good hand hygiene practices. Other team players who are slowly coming on board are patients and caregivers who are encouraged to remind the healthcare workers to perform hand hygiene before commencing care. The uptake among patients and caregivers, however, is slow.\(^3\) The one-on-one engagement promotes long-term sustainability in good hand hygiene practices, as staff are encouraged to take personal responsibility for their own practices.

Acknowledgements
I would like to acknowledge Senior Nurse Clinician Ying Ling Chow (NCIS) and Nurse Clinician Poh Chi Tho (EBNU) for their guidance and kind assistance in the use of JBI-PACES and GRIP; Nurse Educator Mien Li Goh, and the NUHS Medical Publications Support Unit for their assistance in editing the manuscript. I also extend my gratitude to the Nurse Managers, Nurse Clinicians, and Nurse Educators of Ward 58/58HD, Ward 57 Oncology and Ward 86 for giving the team members time to complete the project.
References

Figure 1
Criteria legend
1. Alcohol-based hand rubs are routinely used for hand hygiene unless hands are visibly soiled. (10 of 10 samples taken)
2. Hands are decontaminated immediately after contact with individual patient contact and/or all inanimate objects, including equipment. (10 of 10 samples taken)
3. Hands are decontaminated immediately before each and every episode of direct patient contact or care, and/or contact with all inanimate objects, including equipment. (10 of 10 samples taken)
4. Hands are decontaminated with an alcohol-based hand rub (unless hands are visibly soiled) between different care activities for the same patient. (10 of 10 samples taken)
5. Hands that are visibly soiled or potentially grossly contaminated with dirt or organic material are washed with liquid soap and water. (10 of 10 samples taken)
Figure 2
Criteria legend
1. Alcohol-based hand rub are routinely used for hand hygiene unless hands are visibly soiled. (130 of 130 samples taken)
2. Hands are decontaminated immediately after contact with individual patient contact and/or all inanimate objects including equipment. (130 of 130 samples taken)
3. Hands are decontaminated immediately before each and every episode of direct patient contact or care, and/or contact with all inanimate objects including equipment. (130 of 130 samples taken)
4. Hands are decontaminated with an alcohol-based hand rub (unless hands are visibly soiled) between different care activities for the same patient. (130 of 130 samples taken)
5. Hands that are visibly soiled, or potentially grossly contaminated with dirt or organic material, are washed with liquid soap and water. (130 of 130 samples taken)
6. Staff have received education about hand hygiene. (130 of 130 samples taken)
Fall prevention strategies in an adult haematology oncology unit: a best practice implementation project.

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Abstract

Background
Fall is a common problem faced in healthcare organisations. It is an act of collapsing or a sudden uncontrolled descent. The consequences of fall could lead to serious complications, prolonged hospital stay and increased mortality. Thus, it is essential to provide education to staff, patients and family members using educational aids such as videos and posters to reinforce message incorporating fall prevention strategies.

Aim
The aim of the project was to implement best practice in fall prevention strategies to reduce the fall rate to 0% in an adult haematology oncology ward.

Methods
The team conducted a pre- and post audit using the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES). The team utilised six out of the nine criteria from the system to audit 22 nurses working in a 16-bed haematology oncology ward.

Results
Comparing the pre- and post audits results, there was a significant improvement of 90% in all criteria after implementing educational aids such as videos and posters to create awareness among nurses, patients and family members.

Discussion/conclusion
This project had successfully introduced available educational aids to patients and family members to educate them on fall prevention. It also emphasised the importance of fall prevention education to nurses in the ward. The nurses had gained confidence in performing patient family education to the patients and were ready to be ambassadors in carrying out evidence-based practice to nurses in other ward.

Keywords: complication, educational aids, fall prevention, nurses, patients

Background
Patient fall is a common problem faced in the hospital. It is a frequent and serious cause of hospital-acquired injuries and frequently prolonged hospital stay due to the fall. Fall is defined, as ‘inadvertently coming to rest on the ground, floor or other lower level’. It is an act of falling, collapsing, or a sudden uncontrolled descent. The consequences of falls are bone fractures, intracranial haemorrhage, and even increased mortality. In Singapore, there were 6000 incidents of falls reported from 2003 to 2004. Similarly, in Australian hospitals, falls made up the largest category of 38% of all reported incidents. Falls occurring in the hospital are adverse events which lead to serious consequences such as impacts on patients’ quality of life, increased financial cost and compromised patients’ outcome. These serious consequences pose a great challenge for healthcare organisations to reduce the rate of patient falls. Patient falls is one of the common reasons for healthcare personnel being involved in lawsuits for medical negligence in the acute settings. There is a need to use multi-factorial fall prevention strategies to reduce the rate of falls in the hospital.
Patients with cancer are admitted to the haematology oncology ward for various reasons, mainly to receive cancer treatment and manage complications related to cancer treatment. They are at risk of falls which are potential markers of disease progression or consequences of disease progression. Studies stated that patients with cancer need education to help them make complex decisions. Thus providing them with educational materials that are accurate, informative and easy assessable is beneficial for them. Education materials such as videos specifically designed to provide information could be effective tools to empower patients.

Evidence-based practice suggests that imparting knowledge to nurses and understanding of fall prevention strategies will reduce fall rates. It is essential to run education programs to increase their awareness and identify appropriate interventions to prevent fall. Thus, the intent of this project is to provide awareness on the importance of fall preventive strategies to the nurses working in a 16-bed adult haematology oncology ward. With the awareness, the nurses would be able to implement educational aids to patients and family members as part of a strategy to prevent falls. Studies had proven that these strategies are a vital component for effective fall prevention programs.

Audit question
To what extent do education aids help in reducing fall rates in the adult haematology oncology ward?

Aim
The aim of the project was to implement best practice in fall prevention strategies to reduce fall rates to 0% in an adult haematology oncology ward

The objectives of the project were:
- To educate the nurses on best practice in fall prevention strategies
- To develop educational aids on fall prevention for the patient and family members as one of the preventive strategies in reducing the fall rate in the adult haematology oncology ward
- To monitor compliance according to the best practice criteria on fall prevention.

Ethical consideration
This is a quality improvement project incorporating documentation review and patient interviews. Therefore, ethic approval was not required. However, patients’ safety and staff confidentiality were maintained throughout the audit period.

Methods
The team conducted a pre- and post audit using the Joanna Briggs’ Institute Practical Application of Clinical Evidence System (JBI-PACES). JBI-PACES is an online tool used for identifying gaps, implementing changes and reviewing the effectiveness throughout the project’s duration. Getting Research into Practice (GRIP) was used for barriers identification, formulation of strategies and resources identification. This project was implemented over six months, from July 2012 to December 2012 (Appendix 1), and over three phrases:

Phase 1: Pre-implementation phase
Identification of topic
The topic chosen for this project was due to the high occurrences of falls in the ward. There were six falls due to medication, knowledge deficit and environmental factors between 2011 and 2012. As the impact of falls is great for both patients and the hospital, the project team decided to implement fall prevention strategies to promote patient safety.

Establishing of the audit team
In addition to the leader and co-leader, who were involved in the JBI fellowship program, the team recruited three senior staff nurses as part of the project team. These nurses were falls champions in the ward. All members of this project were involved in gathering data and implementing changes. The nurse manager and nurse clinician were the key stakeholders of the project. They provided management support and expert opinion to the team to ensure that the project ran smoothly. The members of this project were given protected time every month to audit and assist in the implementation of the project.
Setting up JBI-PACES
The team adopted the criteria based on the best available evidence found in JBI-PACES.\textsuperscript{12} There were nine criteria retrieved from the JBI-PACES; however, the team utilised only six criteria. The team excluded the other three criteria as it was decided that these criteria were not applicable for the audit.

The audit criteria were:
1. Fall risk assessment is done accurately using a falls assessment tool.
2. Fall risk assessment is done on admission.
3. Fall risk preventative interventions are evaluated.
4. Patient and family education is carried out for patients at risk for falls.
5. Reassessment occurs when there is a change in condition or following a fall.
6. Targeted interventions are implemented according to risk factors.

Conduct baseline audit
The audit team conducted the baseline audit in an adult haematology oncology ward for the 22 nurses over a period of two weeks. The sampling included all staff nurses in the ward except the audit team who were involved in the project. The audit team gathered and recorded the data on a data collection sheet, which the leader printed out from the online JBI-PACES program.

Phase 2: Implementation phase
The team analysed the baseline audit results and shared the audit findings with the nurses in the ward. The team leader invited all members and nurses in the ward to attend the presentation and asked for feedback and suggestions. GRIP was then utilised to identify the potential barriers and strategies to overcome the barriers.\textsuperscript{12} (Table 1).

There were two barriers identified during the presentation:
1. Patient and family members received insufficient education on the importance of fall prevention.
2. Nurses were not aware of the importance of reassessment when there were changes to conditions or following a fall, which lead to poor implementation of targeted intervention.

Strategies employed to tackle the barriers were:
1. Develop a video on the importance of fall prevention.
2. Use of posters and cue cards to create awareness for patients, family members and healthcare personnel.

During the implementation phase, the team worked together to develop fall prevention education aids such as education videos, posters and cue cards. The team conducted three to four rounds of educational and information-sharing sessions for the nurses with the aim of demonstrating how to utilise the education aids as part of patient and family education. During the first two weeks of implementation, the team ensured that the nurses showed the education video to every new patient admitted to the ward. The team also placed the posters and cue cards at all patient beds to remind the nurses to carry out the patient and family education for patients at risk of falls.

Phase 3: Post implementation phase
The audit team conducted the post implementation audit to monitor the compliance rate over a period of two weeks using the same methodology as that used in the baseline audit. The number of nurses audited (22) remained the same as the baseline audit. The audit team compared and analysed the post implementation audit results with the baseline audit results.

Results
Figure 1 shows the baseline audit results. Both criteria 1 and 2 achieved a 93\% compliance rate; however, criteria 3 achieved a 100\% compliance rate. There was only a 36\% compliance rate in criteria 4 and a 73\% compliance rate in criteria 5. For criteria 6, the result showed a 57\% compliance rate.

Figure 2 shows the post implementation audit results. All criteria achieved 100\% in compliance rates except for criteria 6, which scored a 92\% compliance rate.

Discussion
This project has produced positive outcomes for all criteria. The education and information-sharing sessions conducted by the team was the main factor contributing to the improvement of this project during the implementation phase. In this session, the team not only imparted knowledge on fall prevention strategies, they also reinforced to the nurses the importance of utilising education aids to educate patients at risk of falls. This method has allowed
the nurses to realise that educational material is an effective tool to empower patients. The video, posters and cue cards developed by the team had created a better understanding of fall prevention for patients and their families. Studies had stated that visual aids helped to improve retention and patients were more empowered in caring for themselves if they understood the contents of the patient educational material well.

**Limitations**

The challenge faced by the team was the short time frame in the development of the education aids. The team could only develop the video in English and Chinese. They had hoped to narrate the video in Malay and Tamil so that Malay and Indian patients could watch the video if they did not understand English. The nurses were also unable to show the video to patients at the room television set; however, the patients could watch the video using a Computer on Wheels (COW). This caused some inconvenience for the nurses as they needed to push the COW into the patients’ rooms whenever they needed to educate patients and family members on fall prevention.

**Sustenance plan**

The team plans to monitor the compliance rate by conducting three monthly audits for a period of six months, followed by six monthly audits to ascertain if all the criteria achieved 100% in compliance rates. The team will continue to share the audit results with the nurses and the stakeholders to encourage and motivate them to maintain good results. To maintain 100% compliance rate in all criteria, the team intends to educate every new nurse who joins the ward. The team also plans to extend the project to another ward in the future with the aim of creating awareness on the importance of patient family education using educational aids.

**Conclusion**

This project has successfully introduced available educational aids to patients and family members to educate them on fall prevention. It also emphasised the importance of fall prevention education to nurses in the ward. The nurses have gained confidence in performing patient family education to patients and are now ready to be ambassadors in promoting evidence-based practice to nurses in other wards.

**Acknowledgements**

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References:
Appendix 1: Gantt chart

Table 1: Summary of barriers and strategies on fall prevention strategies

<table>
<thead>
<tr>
<th>No.</th>
<th>Barrier</th>
<th>Strategies</th>
<th>Resources</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Insufficient education was delivered to patient and family members on importance of fall precaution</td>
<td>Develop a video on importance of fall precaution</td>
<td>Staff for filming, photo taking, voice recording and translation</td>
<td>Achieved compliance rate in fall prevention strategies with teamwork, enhance leadership and knowledge</td>
</tr>
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<td></td>
<td></td>
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</tbody>
</table>
| 2.  | Poor compliance of reassessment when there is a change of condition or following a fall which will lead to poor implementation of targeted intervention | a) Use of posters for patients, family members, oncoming staff and healthcare personnel  
b) One-on-one engagement | Fall champions                                      | Created awareness of fall prevention to patient, family members and healthcare personnel |
The audit criteria were:
1. Fall risk assessment is done accurately using a falls assessment tool.
2. Fall risk assessment is done on admission.
3. Fall risk preventative interventions are evaluated.
4. Patient and family education is carried out for patients at risk for falls.
5. Reassessment occurs when there is a change in condition or following a fall.
6. Targeted interventions are implemented according to risk factors.

**Figure 1: Baseline audit**

The audit criteria were:
1. Fall risk assessment is done accurately using a falls assessment tool.
2. Fall risk assessment is done on admission.
3. Fall risk preventative interventions are evaluated.
4. Patient and family education is carried out for patients at risk for falls.
5. Reassessment occurs when there is a change in condition or following a fall.
6. Targeted interventions are implemented according to risk factors.

**Figure 2: Post audit finding**
Oral hygiene of patients with cancer in an acute oncology ward: a best practice pilot project

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Abstract

Background
Oral hygiene is a practice of maintaining healthy oral conditions. Oral hygiene is one of the most basic essential nursing interventions. The provision of oral hygiene is necessary for eating, communicating, preventing infection, and promoting comfort. However, studies have shown that a majority of hospitalised patients do not present satisfactory oral hygiene, as it is often a neglected component.

Aim
This aim of this project is to improve the oral hygiene of patients with cancer in an oncology ward by implementing best practice intervention.

Methods
The team utilised the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES) program to facilitate the collection of the pre- and post audit data. The Getting Research into Practice (GRIP) program was used to analyse the barriers and design an action plan. This project was conducted in three phases over a five-month period. It took place in a 24-bed oncology ward located in an acute tertiary hospital in Singapore.

Results
Comparing the pre- and post audit results, there was a significant improvement in all four criteria. There was an increase of 50% in patients having their toothbrushes and toothpaste available during hospitalisation. The compliance rate for patients performing tooth brushing twice a day doubled (42% to 83%). 100% of nurses received education on oral hygiene. Lastly, 67% of patients had proper denture care, from 0% at the baseline phase.

Conclusion
In conclusion, this project has successfully utilised best practice in relation to oral hygiene management in our clinical setting. With an effective oral hygiene intervention in place, cancer patients’ oral hygiene will be maintained and continue in the clinical setting. In addition, engagement between the team and the nurses not only produced satisfied and productive nurses, it motivated the nurses to provide additional care to the patients. Thus, this was an important factor in improving patient satisfaction.

Keywords
education program, JBI best practice, oral hygiene, tooth brushing, nurse

Background
Oral hygiene is a practice of maintaining healthy oral conditions. Oral hygiene is one of the most basic essential nursing interventions. The provision of oral hygiene is necessary for eating, communicating, preventing infection, and promoting comfort. However, in Neto et al’s studies have shown that a majority of hospitalised patients did not present satisfactory oral hygiene, as it is often a neglected component.

Patients with cancer have a higher prevalence of oral complications due to cancer treatment such as chemotherapy, radiotherapy and immunosuppressive therapy.
Poor oral health affects patients’ general well being and their quality of life. This impact will cause adverse effects on their behavioural and social interaction.\textsuperscript{10} Besides, it complicates care for patients with cancer and affects the patient’s treatment outcome. This may prolong the length of stay in the hospital in order to manage the oral complications thus increasing the financial cost to the patient.

The JBI Best Practice\textsuperscript{8} and Stein et al\textsuperscript{7} recommends that tooth brushing be used in conjunction with fluoride toothpaste as the gold standard for oral hygiene for all patients. A toothbrush and toothpaste should be available for patients in the clinical setting and tooth brushing is to be performed twice a day.\textsuperscript{8} Dentures should be cleaned at least once a day to prevent denture-related infection.\textsuperscript{10} It should be soaked in clean water at night or when not worn. Denture storage containers require regular cleaning to prevent the growth of microorganisms. It should be also labelled to prevent any mix-ups.\textsuperscript{10}

In general, conscious patients are empowered to do their own tooth brushing. Assistance is offered to those conscious patients with some form of limitation like pain, oedema, breathlessness and impaired mobility. This type of assistance would include bringing the patient to the basin or preparing the toothbrush with toothpaste.

Daily observation in one of the oncology wards in an acute tertiary hospital shows that not all patients have toothbrushes and toothpaste available during their hospitalisation. Nurses routinely offer oral gargling instead of tooth brushing as a provision for oral hygiene. Patients with dentures are often neglected as well. The dentures are left in the storage container for days without any cleaning performed. It shows a lack of emphasis on and staff’s consistency in the provision or oral hygiene in the clinical setting.

Although the organisation has the standard operating procedure for providing oral hygiene, nurses still express confusion over appropriate oral hygiene practices. This has resulted in a lack of consistency in practice, which was brought to the team’s interest which led to initiate plan to undertake oral hygiene intervention in the oncology ward.

**Audit question**
To what extent are we engaging in best practice for oral hygiene in acute oncology settings?

**Aim**
To improve the oral hygiene of patients with cancer in an oncology ward by implementing best practice intervention.

**Objectives**
- To educate nurses on the importance of oral hygiene.
- To motivate nurses in assisting conscious patients to perform tooth brushing twice a day.

**Ethical considerations**
This audit process involved only observation and interviewing of patients. There was no formal procedure performed on the patients. Patients’ confidentiality and privacy were maintained at all times. Therefore, ethical consideration was not required.

**Method**
The team utilised JBI-PACES to key in audit data and tabulate results. Getting Research into Practice (GRIP) was used to analyse the barriers and to design an action plan. This project was conducted in three phases over a five-month period from February to June 2012 (Appendix 2).

**Phase 1: Preparation for audit**
**Identifying an audit topic**
The topic chosen for this project was ‘oral hygiene for patients with cancer in an oncology ward’. Based on observation, patients do not brush their teeth during their hospitalisation stay. Most importantly, poor oral hygiene will result to oral complications and affect their treatment outcomes.
Establishing the project team
A nurse educator who was the team leader led the project and the co-leader was a senior registered nurse. Both were working in the same ward and had attended the JBI Clinical Fellowship Program together. The team leader recruited two more registered nurses who processed the quality of embracing change and were able to provide a good positive influence to staff and patients. The leader and co-leader together with team members were involved in the data collection. All members of the team had direct patient care. The nurse manager and other two nurse clinicians were the key stakeholders for this project. The reason for choosing the identified shareholders was the need to obtain management support and the clinician’s expert opinion in order for the project to run smoothly.

Identifying the setting and sample size
This project took place at a 24-bed oncology ward located in an acute tertiary hospital in Singapore. As this was a pilot project, the team decided to start with a sample size of 12 patients with cancer. The patient selection criterion was an oncology or haematology patient who had teeth and/or dentures and who was physically independent or who required partial assistance.

Formulation of audit tools and procedure
From the list of criteria generated from JBI-PACES, the team chose four most recommended practices that best fitted the context with the best grading of evidence. The assessment of compliance and the audit procedure of the four criteria were as follows:

Criterion 1: A toothbrush and toothpaste (where necessary floss and mouth rinse) is available to the patients. (Grade A)
Compliance: To achieve 80% of patients having a toothbrush and toothpaste available during the period of hospitalisation.
Audit procedure: Auditor observed if the patients had a toothbrush and toothpaste at their bedside.

Criterion 2: Tooth brushing is performed twice a day. (Grade A)
Compliance: To achieve 80% of patients performing toothbrushing at least once a day.
Audit procedure: Auditor observed and asked if the patients brushed their teeth in the morning and evening.

Criterion 3: Staff has education and training on oral hygiene practices (Grade B)
Compliance: To achieve 100% of nurses having received education and training on oral hygiene practices
Audit procedure: Auditor conducted education groups to educate the staff on the best-recommended practices on oral hygiene.

Criterion 4: Daily cleaning of dentures with toothbrush and toothpaste. (Grade B)
Compliance: Achieve 80% of patients cleaning their dentures daily.
Audit procedure: Auditor observed and asked if the patients cleaned their dentures with a toothbrush and toothpaste at least once a day.

Baseline audit
The team leader held a meeting with the stakeholders and team members prior to conducting the baseline audit. The leader and co-leader approached the stakeholders and team members to explain the reason, the audit process and timeframe of the project. The team members conducted the baseline audit during the first two weeks of March using the audit tools (Appendix 1) developed by the team leader and co-leader. The team members collected the data by observation and by interviewing the patients. All the gathered data were collected and keyed into the JBI-PACES program.

Phase 2: Implementation of best practice
The team leader held a meeting with the nurses and shared the baseline audit findings. Through the session, nurses discussed the different types of barriers faced in the clinical setting and developed an action plan aimed at achieving compliance in oral hygiene practices. Using GRIP, the identified barriers were keyed in and analysed, and an action plan developed as shown in Appendix 4. The audit findings, barriers and action plan were shared with the stakeholders and team members during the second meeting. In the meeting, the team leader and co-leader briefed the team members on their role in managing the implementation phase.
During the implementation period, 25 registered nurses and enrolled nurses attended an educational program conducted by the team leader and co-leader. The team conducted four sessions of the educational program and each session comprised a group of six to seven registered and enrolled nurses. The aim of the educational program was to equip the nurses with knowledge and skills to perform the oral hygiene practices competently.

The implementation period lasted eight weeks. During this period, the team monitored the new practices constantly and maintained open communication with nurses to ensure compliance. If there was any non-compliance, the team would provide one-on-one coaching to the nurses and address issues related to the new practices.

Phase 3: Post implementation audit

The team members together with the leader and co-leader conducted the post implementation audit over a period of two weeks using the same methodology as the baseline audit. The co-leader keyed in the collected data into JBI-PACES. The audit results were shared with stakeholders and team members.

Results

Baseline audit

The baseline results (Appendix 3) showed that 50% of the patients did not have toothbrushes and toothpaste at their bedside and 58% did not brush their teeth twice a day. Three out of the 12 patients had dentures. However, 100% of them did not clean their dentures with a toothbrush and toothpaste at least once a day. Lastly, 0% of the staff received education and training on oral hygiene practices.

Post implementation audit

Appendix 5 shows the post implementation results: 100% of the patients had toothbrushes and toothpaste at their bedside compared to the 50% in the baseline data. 83% of the patients had performed tooth brushing at least twice a day compared with the baseline data which showed a 42% compliance rate. Of the 12 patients, only three had dentures. Of the three patients with dentures, only one did not follow the correct technique of denture care. There was a 67% increase for this criterion.

Lastly, 100% of the nurses received education and training on oral hygiene practices.

Discussion

For criterion 1, there was 100% compliance in the availability of toothbrushes and toothpaste for patients. The strategies to overcome is the introduction of a ‘toothbrush and toothpaste’ stamp on the current Oral Assessment Guide form. The Oral Assessment Guide form is an oral assessment tool that nurses use to assess the oral condition of all newly admitted patients. The nurses who used this form during admission were prompted by the stamp to ask patients whether they had their toothbrushes and toothpaste, or at least to remind the family members to bring those items for them. A complimentary toothbrush and toothpaste will be provided to those patients who may not have family or friends to provide for them. With the ease of availability, the most basic fundamental oral hygiene care will not be neglected during hospitalisation.

For criterion 2, there was an increase in the compliance rate from 42% to 83% indicating patients were performing tooth brushing twice a day. The key factor contributing to the increase in compliance was the team incorporating a second oral hygiene round in the evening into the ward routine to achieve tooth brushing twice a day.

For criterion 3, the improvement of 100% in the compliance rate of nurses receiving education and training on oral hygiene practices was due to the scheduled oral hygiene education program conducted by the team. The team leader worked with the roster maker of the ward to ensure that all nurses working in the oncology/haematology ward could attend the 30-minute oral hygiene educational program before the implementation phase. The key objective of the educational program was to effectively promote awareness and significantly empower the nurses in their integral role.
As for criterion 4, the team managed to raise awareness on the importance of denture care to patients with dentures. This was evidenced by the increase in compliance from 0% to 67% as shown in the post implementation results. During the oral hygiene education program, the team emphasised to the nurses on the importance of denture care and correct practices in the care of dentures.

**Success factor**

There were three factors which contributed to the success of the project. The first is the standardisation of oral hygiene practices in the clinical setting. It communicated the common understanding and set expectations of the nurse’s role in the oral care provision. The second factor is the introduction of complimentary toothbrushes and toothpaste for patients. The third factor is the introduction of an education program on oral hygiene practices. This program equipped all the nurses with knowledge on evidence-based oral care hygiene practices.

**Barriers**

After the educational program, the challenges the team faced were the unwillingness of nurses to change their comfort work level and their perception that tooth brushing was too time consuming. Oral hygiene was also not a priority in their care planning. Thus, this led to nurses not performing the new oral hygiene practices. Studies show that simply sharing data with the nurses do not ensure the nurses will identify with the significance of the data and act accordingly to change practices in a positive way. In fact, for quality plans to be successful, the nurses must be fully engaged in work to promote work excellence. Hence, to overcome this barrier, the project team members personally initiated the new changes in the clinical setting and worked hand-in-hand with the nurses, addressing any individual issues in their care management. This helped the nurses to be fully engaged in the work and concurrently promoting clinical excellence. Studies also state that work engagement acts as the mediating mechanism between the organisational condition, job performance and work behaviours and thus leads to a more satisfied and productive nurse.

Role modelling and one-on-one coaching was the management style that the team adopted. Role modelling inspired and taught by example and through coaching, these nurses were encouraged to work creatively on problems, facing their areas of responsibility in a positive, constructive way. Overall, this helped in boosting their confidence in their performance.

The next barrier was the small sample size of patients with dentures. The small sample size meant that the results might not have been viewed as being very convincing in terms of nurses’ compliance to appropriate denture care. Future research with a larger sample size would render the result findings more significant.

**Project sustenance plan**

As for the project sustenance plan, the team has to ensure that there is routine communication between the nurses and project team to ensure compliance especially in the evening oral hygiene rounds.

Two more initiatives will be implemented to help with the sustenance of the project. Firstly, an educational package on oral hygiene for all newly-recruited nurses. This will help ensure that all nurses working in the oncology/haematology ward are competent in their oral hygiene practice. Secondly, the team will also encourage patients to ask for tooth brushing assistance. An orientation leaflet on oral hygiene best practice will be given to newly-admitted patients and a poster will be posted at the patients’ bedside to remind them to brush their teeth twice a day.

For the next three months, the team will continue to promote oral hygiene best practice to the entire ward of 24 beds. A post implementation three-monthly audit will be conducted to monitor the compliance. If the results continue to show compliance, the team will follow with the sustenance plan of six-monthly audit. At the same time, the team plans to promote the practice in the other wards as well.
Conclusion

In conclusion, this project has successfully utilised best practice on oral hygiene management in our clinical setting. With an effective oral hygiene intervention in place, cancer patients’ oral hygiene will be maintained in the clinical setting. In addition, engagement between the team and the nurses not only produces satisfied and productive nurses, it also motivates the nurses to provide additional care and concern to the patients. This will be an important factor in improving patient satisfaction.

Acknowledgement

We would like to thank Dr Emily Ang and Chow Ying Leng, Senior Nurse Clinician, for holding and assisting us in this education fellowship program, our stakeholders for their valuable feedback and support in ensuring a smooth project, and the team members, Toh Shir Gi and Aileen Tan Wei Ling, for their commitment and time for data collection, conducting the educational sessions and managing the implementation phase of this project.

We would like to thank all nurses who have participated in the oral hygiene sessions and have given us their most valuable thoughts/solutions to make this change in oral hygiene practices a success!

Lastly, our appreciation goes to Ms Celestine Cheong for complimentary toothbrushes and toothpaste.

References

5. Gillam JL, Gillam DG. The assessment and implementation of mouth care in palliative care: a review. Research 2006; 126(1);pp.3337.
7. Stein P, Henry RG. Poor oral hygiene in long-term care: Nurses must provide better oral care to older adults and patients with severe disabilities. American Journal of Nursing 2009; 109(6);pp.44-49.
### Appendix 1: Oral hygiene audit tools

<table>
<thead>
<tr>
<th>SN</th>
<th>JBI criterion</th>
<th>Observation</th>
<th>Validate documentation</th>
<th>Met</th>
<th>Not met</th>
<th>NA</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A toothbrush and toothpaste (where necessary floss and mouth rinse) is available to the patients. (A) Compliance To achieve 80% of patients having a toothbrush and toothpaste available during the period of hospitalisation.</td>
<td>Nurse asks patient whether a toothbrush and toothpaste is available. If not available, assess reason for not bringing.</td>
<td>Check the availability of toothbrush and toothpaste at patient’s bedside.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Toothbrushing is performed twice least once a day.(A) Compliance To achieve 80% of patients performing toothbrushing at least once a day.</td>
<td>Observe and ask patients if they have brush their teeth in the morning.</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Daily cleaning and of dentures with toothbrush and toothpaste.(B) Compliance To achieve 80% of patients cleaning their dentures daily.</td>
<td>Observe and ask patients whether they clean their dentures with toothbrush and toothpaste.</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 2: Project outline

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Duration</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Preparation</td>
<td>7 wks</td>
<td>19 Jan to 4 Mar 2012</td>
</tr>
<tr>
<td>2</td>
<td>Conduct baseline audit (pilot)</td>
<td>2 wks</td>
<td>5 Mar to 18 Mar 2012</td>
</tr>
<tr>
<td>3</td>
<td>Conduct educational program (pilot)</td>
<td>3 wks</td>
<td>19 Mar to 8 Apr 2012</td>
</tr>
<tr>
<td>4</td>
<td>Implementation (pilot)</td>
<td>8 wks</td>
<td>9 Apr to 3 Jun 2012</td>
</tr>
<tr>
<td>5</td>
<td>Conduct post implementation audit (pilot)</td>
<td>2 wks</td>
<td>4 Jun to 17 Jun 2012</td>
</tr>
<tr>
<td>6</td>
<td>Implementation (spread)</td>
<td>12 wks</td>
<td>1 July to 30 Sept 2012</td>
</tr>
<tr>
<td>7</td>
<td>Conduct 3 months post implementation audit (spread)</td>
<td>2 wks</td>
<td>1 Oct to 14 Oct 2012</td>
</tr>
<tr>
<td>8</td>
<td>Sustenance</td>
<td>24 wks</td>
<td>29 Oct 2012 to 5 May 2013</td>
</tr>
<tr>
<td>9</td>
<td>Conduct post 6 months sustenance audit</td>
<td>2 wks</td>
<td>6 May to 19 May 2013</td>
</tr>
</tbody>
</table>

Appendix 3: Baseline audit results

Criteria legend
1. A toothbrush and toothpaste (where necessary floss and mouthrinse) is available to the patients.
2. Toothbrushing is performed at least twice a day.
3. Staff have received education and training on oral hygiene practices.
4. Daily cleaning and of dentures with toothbrush and toothpaste is documented.
### Appendix 4: Barriers and action plan

<table>
<thead>
<tr>
<th>No.</th>
<th>Barriers</th>
<th>Strategies</th>
<th>Resources</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Patient not bringing tooth brush and toothpaste</td>
<td>Introduction of stamp chop “toothbrush and toothpaste yes or no”</td>
<td>Stamp</td>
<td>Patient will be reminded to bring tooth brush and tooth paste</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Complimentary of toothbrush and toothpaste</td>
<td>Supply from the service culture unit</td>
<td>Tooth brush and tooth paste are available for patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Patient performing tooth brushing once a day instead of twice a day</td>
<td>Initiate 2nd round of oral care provision between 8 to 9 pm</td>
<td>Nurses’ involvement</td>
<td>Patient perform 2nd round of tooth brushing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poster of a toothbrush and toothpaste</td>
<td>Poster</td>
<td>Reminders to nurses that tooth brushing is the first choice of oral care hygiene</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>0% of nurses have received oral hygiene education or training</td>
<td>Conduct education program for the nurses.</td>
<td>JBI best practice and audit findings</td>
<td>Nurses equipped with knowledge and skill to perform oral hygiene practices competently.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>0% of patient received denture care</td>
<td>Incorporate knowledge of denture care in education program</td>
<td>JBI best practice and audit findings</td>
<td>Nurses equip with knowledge and skill to perform denture care practices competently.</td>
</tr>
</tbody>
</table>

### Appendix 5: Pre- and post audit results

![Bar Chart](chart.png)

**Criteria legend**

1. A toothbrush and toothpaste (where necessary floss and mouthrinse) is available to the patients.
2. Toothbrushing is performed at least twice a day
3. Staff have received education and training on oral hygiene practices
4. Daily cleaning and of dentures with toothbrush and toothpaste is documented.
Performing accurate measurement of vital signs in primary healthcare setting: an evidence-based practice project

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Abstract

Background
Vital signs are used to assess the patient's body function and vital sign monitoring is the most fundamental component of nursing care. However, many factors can affect the accuracy of vital signs readings. Therefore, it is important to incorporate the best available practice into nurses' practice on vital signs monitoring.

Aim
This study was designed to improve nurses’ practice in the primary healthcare setting on vital sign measurements.

Methods
A pre- and post intervention audit was conducted using the Joanna Briggs Institute Practical Application of Clinical Evidence System (JBI-PACES). Joanna Briggs Institute Getting Research Into Practice (GRIP) was employed to examine barriers and to design the implementation program. This study was conducted from July to December 2012 and conducted in a primary healthcare institution in Singapore.

Results
There were improvements in all criteria except for criteria 4. The greatest improvement was in criteria 1 (the blood pressure cuff around the arm firmly with the centre of the bladder is positioned over the brachial artery). 100% of the nurses adhered to criteria 1 during the post implementation audit. However, in criteria 4 (vital signs are documented), the number of nurses having problems in documentation remained unchanged.

Discussion/conclusion
The team concluded that most of the nurses had integrated the recommendations into their daily delivery of care. Education and the availability of equipment were essential to eliminate variations in practice. Non-intimidating guidance had also proved essential to reduce resistance during the implementation period.

Keywords
evidence-based practice, nurses, primary healthcare, variations, vital signs measurements

Background
Vital signs monitoring encompass temperature, blood pressure, pulse rate and respiratory rate. Vital sign monitoring is the most fundamental component of nursing care. Vital signs are used to assess the patient's body function. All nurses were taught in nursing schools that patients' vital signs are essential in identifying clinical deterioration.
In Singapore, primary healthcare involves primary medical treatment, preventive healthcare and health education. There are 18 polyclinics in Singapore which provide 20% of the primary healthcare in Singapore. A polyclinic is a one-stop health centre which provides outpatient medical care, treatment and continuation of care to patients who are just discharged from various secondary and tertiary institutions. Being a primary healthcare institute, the polyclinic also provides other services such as immunisation, health screening and counselling. Besides providing services to the community, the polyclinic also serves as a teaching institute to train healthcare professionals including medical and nursing students. Being part of the primary healthcare network, staff working in the polyclinic will look after patients with both chronic and/or acute conditions of differing severity. Each polyclinic will mainly look after the patients in their respective community. According to the attendance chart provided by Singapore Ministry of Health, 2012, the attendance in the polyclinic reached more than 300,000 per month.

In the polyclinic, vital signs measurements are used in many activities such as observation and triaging. These activities are commonly carried out by either the staff nurse (SN) or assistant nurse (AN) in the treatment room of the polyclinic. Patients can be diverted to the treatment room by various healthcare workers (HCWs) for various reasons. The health attendants (HAs) or patient service associates (PSAs) will send patients for triaging if they deem that the patient is unfit to wait for consultation. The doctors can also send patients to the treatment room for treatment, observation or monitoring prior to sending the patient to the hospital for further evaluation or management. Therefore, it is important that these parameters be measured consistently and accurately. The patient’s vital signs will affect triage outcomes and treatment plans. This will then allow the clinician(s) to detect any deterioration, and make early and accurate diagnosis.

With technological advancements, healthcare workers (HCWs) will often use technology to streamline processes. In the polyclinic setting, nurses will use automated oscillometry device such as DINAMAP (Device for Indirect Non-invasive Automatic Mean Arterial Pressure) to monitor the patient’s blood pressure, pulse rate and oxygen saturation. Besides the automated oscillometry device, polyclinic nurses also use the tympanic thermometer to obtain the patient’s temperature.

However, many factors can affect the accuracy of vital signs readings. This includes time constraints, lack of knowledge on operating the device, user technique, calibration and maintenance. Therefore, it is important to incorporate the best available practice into nurses’ practice on vital signs monitoring. Although monitoring of vital signs is a routine procedure, there is a lack of reliable best practice statements on vital signs monitoring, hence the team decided to employ Joanna Briggs Institute (JBI) best practice criteria to guide nurses on monitoring of vital signs.

**Audit question**

To what extend are vital signs accurately measured and in accordance with evidence-based practice by nurses in the polyclinics?

**Aim**

The overall aim of this project was to improve the polyclinic nurses’ practice on vital signs monitoring for patients according to the best-available evidence.

**Objectives**

1. To eliminate variability in the practice of vital signs monitoring among nurses.
2. To ensure that 100% of the nurses adhere to best practice recommendations when performing vital signs measurements.
3. To ensure that 100% of the nurses who perform vital signs measurement attend the training provided by the team.
4. To utilise the audit and feedback process embedded within JBI-PACES and GRIP to implement change.
5. To achieve 100% accurate documentation on vital signs monitoring.
Method

This project was divided into three phrases, pre-implementation, implementation and post implementation. The project was implemented over a period of six months from July to December 2012.

Ethical consideration

Formal ethical approval was not required as this was an improvement project to improve nurses’ practice on vital signs measurements. Besides, no patient data was used in the entire project. During the audit, team ensured that staff’s confidentiality and privacy was maintained at all times.

Phase 1: Pre-implementation phase, from 2 July to 2 September 2012

Identification of topic

Vital signs monitoring was identified as it is the most fundamental activity done by nurses. In this project, the team focused only on three vital signs: blood pressure, tympanic temperature and respiration rate. Heart rate monitoring was excluded because DINAMAP is used to monitor heart rate in the polyclinic.

Forming team

The Director of Nursing from the polyclinic nominated two staff nurses to attend the JBI Fellowship Training program from 2 to 6 July 2012 to acquire knowledge and utilise the best-available practice in current practice. These two nurses served as the leader and co-leader of the team. Discussion was done with the polyclinic nurse manager on the selection of the project team members. Three registered nurses were selected, which included the polyclinic clinical instructor and treatment room champions.

Roles and responsibilities

The team member participated in the project by gathering data using JBI-PACES vital signs audit tools. They observed and assessed the nurses’ practice when they were measuring vital signs for patients. A meeting was held to teach the team members on the use of the audit tools prior to the audit. Besides assisting in the audits, the team members also participated in mentoring and guiding the nurses during the implementation phase.

Sample size

This study was conducted in Toa Payoh Polyclinic. A total of 16 nurses were selected for this study. The ANs and Care Managers were excluded from the study as they were not rotated to the treatment room and hence did not frequently perform vital signs measurements for patients. Other nurses were rotated to the treatment room based on assignments arranged by the polyclinic nurse manager.

Audit tool

The vital sign audit tool used was based on JBI best-available practice. Four out of nine criteria were selected to assess compliance.

Criteria 1:

The blood pressure cuff is secured around the arm firmly and the centre of the bladder is positioned over the brachial artery.

Compliance: all (100%) blood pressure cuffs are secured at the patient’s arm firmly with the bladder positioned over patients’ brachial artery.

Criteria 2:

The ear canal has been checked for cerumen and any cerumen is removed prior to measurement.

Compliance: all (100%) ear canals are checked for any cerumen prior to tympanic temperature measurement. Any cerumen seen is removed prior to measurement.

Criteria 3:

The method of respiration rate count involves counting for one (1) full minute and counting respiratory rate when the patient is at rest.

Compliance: all (100%) respiratory rate counts involve counting for one (1) full minute and the respiratory rate is counted when the patient is at rest.

Criteria 4:

Vital signs are documented.

Compliance: all (100%) vital signs are documented.
Baseline audit
Baseline audit was conducted from 16 to 10 August 2012. The audit was conducted on the 16 nurses who were rotated in the treatment room. The team only targeted patients over 12 years. According to the organisational policy, temperature, pulse rate and respiration rate measurements are only required for patients over 12 years old. Moreover, the organisation guideline also states that tympanic temperature monitoring should only be used for patients over two years. Thus, axillary temperature measurement is used for patients below two years. After completion the assessment for all 16 nurses, the team then entered these data into JBI-PACES to generate the results. A short survey (Appendix 1) was also developed by the team to assess nurses’ knowledge on vital signs monitoring.

Phase 2: implementation of best practice, from 3 September 2012 to 28 October 2012.

Identify areas of non-compliance
Using the report generated by JBI-PACES and the survey results, the team had a discussion with the team members before sharing the results with the rest of the stakeholders. The data was shared with the rest of the stakeholders on 4 September 2012 using PowerPoint presentation. The team discussed with the nurses on the barriers to non-compliance and then developed strategies to overcome these barriers. The project team maintained open discussion and accepted constructive feedback during the meeting to reduce resistance to change. GRIP was used to examine barriers and to design the implementation program (Table 1).

Barriers
The nurses expressed that there was a lack of equipment such as clocks with a second hand in the treatment room. Besides the lack of equipment, there was also a lack of knowledge in various areas such as the use of various types of blood pressure (BP) cuffs and the importance of checking the patient’s ear prior to tympanic temperature measurement. Other than problems during the measurements of vital signs, the nurses also had issues with documentation. They mentioned that interruptions during documentation often occurred giving rise to potential errors in the documentation.

Strategies to improve compliance
A meeting was held on 5 September 2012 to discuss with the nurses ways to overcome the barriers. All nurses felt that a refresher education session would be beneficial. In addition to the education session, the nurse manager of Toa Payoh Polyclinic agreed to purchase a new table clock with a second hand for the treatment room. This would solve the issue of lack of equipment during monitoring of respiration rates. All the nurses agreed to place the table clock on the computer desk for easy access and viewing. Nurses also discussed ways to reduce errors during documentation. It was agreed and reinforced to all the nurses during the discussion that they should preview all documents before saving the documents to prevent errors.

Education sessions were conducted on 6 September 2012 and 12 September 2012. Two sessions were conducted during lunchtime to ensure that all nurses attended at least one of the sessions. The team developed presentation material based on the latest guidelines and journal articles regarding vital signs monitoring. Each education session consisted of three parts: lecturing, demonstration and repeat demonstration. During the lectures, the team shared with the nurses current best practice guidelines on vital signs monitoring. This updated the nurses’ knowledge and kept them abreast with the latest evidence on vital signs monitoring.

Blood pressure
The team demonstrated to the staff the use of various sizes and types of BP cuffs (small, medium, large brachial cuff and the thigh cuff). The nurses were also informed about the location of these BP cuffs in the treatment room.

Temperature
The team updated nurses on the latest evidence pertaining to tympanic temperature monitoring. Reinforcement was done to all the nurses that checking the patient’s ear for cerumen prior to tympanic temperature monitoring is essential.14

Respiration rate
A table clock with a second hand was placed in the treatment room as requested by the nurses. The team demonstrated to the nurses the right technique to monitor a patient’s respiration rate at rest and when the patient is in distress. The team recommended that the nurses used a stethoscope to guide the counting of the respiration rate especially when the patient is anxious or experiencing shortness of breath. Besides demonstrating techniques and updating the nurses, knowledge was also shared. The team informed the nurses that there was a difference in the counting of respiration rates for 15 seconds and that for one minute.1 Hence, it is important for all nurses to count respiration rates for one full minute.1 The team also stressed that the use of the pulse oximetry to monitor patients’ respiratory status was insufficient15 as it could be inaccurate due to reasons such as hypothermia and the patient being in a state of shock.
Documentation
All nurses agreed to always preview the electronic notes prior to saving the document.

According to Melrose, skills demonstration is an effective teaching strategy. At the end of each presentation, assessment of the nurses' vital signs monitoring skills was conducted to assess competency. The education materials were saved in a common hard disk for easy access so the nurses could refer to these materials when they were in doubt.

During the implementation phase, the leaders and the team members acted as resource persons in the clinical area. Team members were rotated to the treatment room to guide nurses during the transition phase. Ad-hoc walkabouts and checks were done to ensure a smooth transition.

Phase 3: Post implementation audit, from 29 October to end of December
The post implementation audit was conducted in November after the implementation phase. The whole team was involved in the collection of data. The audit started on 6 November 2012 and ended on 28 November 2012. As the number of nurses in the polyclinic was small, this audit was administered to all nurses in the clinic. The team took about four weeks to complete the audit. The sample size was also reduced to 14 as one nurse resigned and another nurse was on extended leave before the audit started. The post implementation audit was conducted in the same manner as the baseline audit using JBI-PACES. The post implementation audit results were shared with the nurses on 30 September 2012.

Results

Baseline audit
Figure 1 shows the baseline audit results. 62% of the nurses applied the BP cuffs around the patient's arm without ensuring that the centre of the bladder of the BP cuff was positioned over the brachial artery. The same percentage of nurses failed to monitor the patient's respiration rate for one full minute. Besides that, none of the nurses checked the patient's ear prior to tympanic temperature measurement and one nurse failed to document vital signs accurately and timely.

Post implementation audit
After eight weeks of implementation of the action plan, there were improvements in the various criteria as shown in Figure 2.

Criteria 1 (blood pressure):
All nurses used the correct size of BP cuff for BP monitoring during the audit. There was an increase in compliance rate from 38% to 100% (more than 1 fold increase).

Criteria 2 (tympanic temperature):
There were six nurses who did not check the patients' ear prior to tympanic temperature measurements. The compliance rate improved from 0% in the baseline audit to 57%.

Criteria 3 (respiration rate):
Three out of 14 nurses did not comply with the recommendation while monitoring the patient's respiration rate. Of the three, one did not monitor the respiration rate for one full minute while the others monitored the patients while they were talking. The compliance rate improved from 38% to 86% (more than a two-fold increase).

Criteria 4 (documentation):
One out of the 14 nurses did not document the full parameter into the documentation system. The staff did not enter the respiration rate into the notes. Interruption was once again the cause of the lapse.

Discussion
Overall, the project managed to meet the objective of improving the polyclinic nurses' practice on vital signs measurement as showed on Figure 2. There were improvements in criteria 1, 2 and 3 with the highest compliance rate of 100% in criteria 1. The refresher education session proved to be the most suitable method for the nurses in the polyclinic as it showed improvement in three out of the four criteria.
Criteria 1 (blood pressure):
By introducing and demonstrating to nurses the use of various types and sizes of BP cuffs, the nurses had a better understanding on the use of BP. Hence, the team was able to achieve 100% compliance rate for this section.

Criteria 2 (tympanic temperature):
Although there was no skill demonstration for tympanic temperature monitoring, there was a modest improvement in this criteria. Updating the nurses with the latest evidence, more than half of the nurses were convinced that checking the patient’s ear prior to tympanic temperature monitoring is necessary. However, there is still a portion of the nurses who had not incorporated this into their daily practices. During the discussion on 30 September 2012, these nurses claimed that they had forgotten to perform the check. We can conclude that not all nurses had integrated this recommendation into their daily practice.

Criteria 3 (respiration rate):
Initially, more than half of the nurses would only measure the patients’ respiration rate for 15 and 30 seconds, or they would measure the patients’ respiration rate when patients were talking. After the implementation, it was observed that more than half of the nurses were monitoring the patient’s respiration rate at rest for a full one minute. All the nurses felt that the addition of a new table clock served as a reminder for the nurses to monitor patients’ respiration rates.

On the other hand, there were three nurses who did not adhere to the recommendations by team. These nurses found it challenging to monitor patients’ respiration rates for one minute at rest. During the sharing of the post implementation results, discussion with the stakeholders was done. The team further recommend the nurses to measure the patient’s respiration rate while the DINAMAP machine was obtaining readings for the patient. The team also encouraged the stakeholders to organise their work to ensure smoother and safer delivery over care.

Criteria 4 (documentation):
Although there was an increase in the percentage of compliance, the number of nurses who did not comply with the standard remained unchanged. Interruptions during work are inevitable during the work. The nurses felt that the use of reminder might be helpful. However, the nurse manager and the team strongly discouraged this practice as it could lead to other problems such as transcribing errors.

Providing guidance on using a non-intimidating manner will minimize the nurses’ resistance towards change. Discussions prior to implementing action plans proved to be helpful as this enabled the team to further explore the problems faced by the staff and also instilled a sense of ownership to the stakeholders. Open and honest communication was always maintained during the discussions to ensure that all key issues were addressed collaboratively. Providing the right equipment also helped in the improvement.

Limitations
Despite improvements observed, there were still limitations in this project. The subjects may have been aware of the auditors’ presence during the observation. This could have led the Hawthorne effect. Ad hoc audits could have reduced this effect, but this was not feasible due to the small sample size and manpower constraints. Moreover, this study was only conducted in one healthcare institution. Hence, it was difficult to conclude that similar interventions could yield the same results in other institutions.

Sustenance
Like all improvement projects, the sustenance of results are important and it is challenging for the team to further improve and maintain results. The project leaders will continue to update the education materials and the nurses on updates in evidence. Besides updating evidence, making ad-hoc walkabouts can provide guidance and ensure that ground staff are adhering to the standards. Furthermore, the project leaders had discussed with the nurse manager to include vital signs monitoring in the orientation program for new staff. A follow-up audit will be conducted in June 2013 to assess if these have been integrated into the nurses’ routine practice.

Conclusion
This project proved that the use of JBI-PACES to conduct pre- and post implementation audits is effective in improving nurses’ practice on vital signs measurement. The team can conclude that keeping nurses’ knowledge updated and the availability of equipment played an important role in changing nurses’ practice in a short period of time.
Acknowledgement

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References

Audit criteria:
1. The cuff is secured around the arm firmly and the centre of the bladder is positioned over the brachial artery.
2. The ear canal has been checked for cerumen and any cerumen is removed prior to measurement.
3. The method of respiratory rate count involves counting for one full minute and counting respiratory rate when patient is at rest.
4. Vital signs are documented.

**Figure 1: Baseline audit**

Audit criteria:
1. The cuff is secured around the arm firmly and the centre of the bladder is positioned over the brachial artery.
2. The ear canal has been checked for cerumen and any cerumen is removed prior to measurement.
3. The method of respiratory rate count involves counting for one full minute and counting respiratory rate when patient is at rest.
4. Vital signs are documented.

**Figure 2: Post implementation audit**
Appendix 1: Survey on vital signs

Please note that the vital signs we are referring to in this survey are: **tympanic temperature, blood pressure and respiration rate**

1) Do you think you are proficient in vital signs monitoring?
   a. Yes 100%
   b. No 0%

2) Do you think that your colleagues are proficient in vital signs monitoring?
   a. Yes 75%
   b. No 25%

If no, please specify the areas (you can choose more than 1):
   a. Tympanic temperature 50%
   b. Blood pressure monitoring using DINAMAP 0%
   c. Respiration rate monitoring 50%

**Tympanic Temperature**

3) Do you routinely check patient’s ear for foreign body and cerumen prior to monitoring?
   a. Yes 81.3%
   b. No 18.7%

**Blood pressure (BP)**

4) Do you know all BP cuff has a bladder?
   a. Yes 68.8%
   b. No 31.2%

5) Kindly choose the following picture of correct BP taking?
   a. 68.8%
   b. 12.5%
   c. 18.7%

**Respiratory Rate (RR)**

6) How long you take to monitor RR?
   a. 10 – 15 seconds 0%
   b. 30 seconds 31.3%
   c. 60 seconds 68.7%
### Table 1: Barriers and strategies

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<tr>
<th>Barriers</th>
<th>Strategies</th>
<th>Resources</th>
<th>Outcome</th>
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| Lack of knowledge on the use of various types of BP cuffs.              | • To conduct education sessions to educate and demonstrate to nurses the use of various BP cuffs.  
  • Teach-back method used to ensure the nurses understood.             | • PowerPoint presentation used and slides were placed in the common disk for easy reference.  
  • Manpower planning.  
  • Room facilities.                                                      | All nurses attended the class. Able to achieve 100% compliance rate during post implementation audit. |
| Nurses having problems choosing the right BP cuff for patients.         | • To conduct education sessions to educate and demonstrate to nurses the use of various BP cuffs.  
  • Teach-back method used to ensure the nurses understood.             | • PowerPoint presentation used and slides were placed in the common disk for easy reference.  
  • Manpower planning.  
  • Room facilities.                                                      | All nurses attended the class. Able to achieve 100% compliance rate during post implementation audit. |
| Nurses were not aware that checking patient’s ear for cerumen is essential prior to tympanic temperature monitoring. | • Update the nurses on the latest evidence on tympanic temperature monitoring. | • PowerPoint presentation used and slides were placed in the common disk for easy reference.  
  • Manpower planning.  
  • Room facilities.                                                      | Able to achieve 57% of compliance rate during post implementation audit.                          |
| Lack of clocks with a second hand in the treatment room.               | To buy more clocks with a second hand for treatment room.                  | 1 table clock with a second hand was bought and placed on the computer desk as requested by the nurses. | Able to achieve 86% of compliance rate during post implementation audit when compared to 38% during baseline audit. |
| Variations on respiration rate monitoring due to lack of knowledge.     | • Updated nurses’ knowledge on respiration rate monitoring.  
  • Guidance in the treatment room  
  • Ad-hoc checks were performed.                                         | • PowerPoint presentation used and slides were placed in the common disk for easy reference.  
  • Manpower planning.  
  • Room facilities.                                                      | Able to achieve 86% of compliance rate during post implementation audit when compared to 38% during baseline audit. |
| Nurses had problems monitoring respiration rates when the patient is in distress. | • Advised nurses to use a stethoscope to guide the counting.  
  • Return demonstration was conducted to ensure nurses understood.     | • PowerPoint presentation used and slides were placed in the common disk for easy reference.  
  • Manpower planning.  
  • Room facilities.                                                      | Able to achieve 86% of compliance rate during post implementation audit when compared to 38% during baseline audit. |
| Documentation of vital signs not done accurately and timely due to interruptions. | Discussion done with the nurses. Advised nurses to always preview the electronic notes prior to saving them. | Room facilities required for discussion.                                                      | Same number of nurses failed to document vital signs reading accurately and in a timely manner. |