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EDITORIAL

Healthy sleep and nursing

Sleep is often recognised as important for health and wellbeing but is often the first thing we give up when life gets busy. For nurses who undertake rotating shift work, this is especially true. Although some may think they are accustomed to short and irregular sleep schedules, others may accept poor sleep as inevitable, or be on the constant search to improve their sleep and reduce fatigue. But how important is sleep? And is healthy sleep even achievable for nurses who undertake rotating shift work?

Poor sleep among healthcare workers is a growing area of concern and interest. The COVID-19 pandemic has increased and highlighted the day-to-day demands of nursing and effects on sleep.[1] During the pandemic, the prevalence of sleep disturbances among healthcare workers and nursing students was 31% and 27% (respectively), compared to 18% of the general population.[2,3] Given that sleep is important for cognitive, emotional and physical wellbeing,[4,5] sleep may be especially important for nurses – a demanding profession that often requires shift work - a known risk factor for poor sleep.[1,6]

Studies support the importance of sleep for nurses.[7-9] Poor sleep has been associated with reduced quality of life, weight gain, hypertension, and diabetes among nurses.[7,8,10-12] In addition to personal health concerns, poor sleep has also been associated with medical errors,[13] reduced job productivity,[9] and burnout.[14-16] Perhaps most concerning, studies suggest that although objective performance continues to decline with chronic partial sleep deprivation, subjective ratings of alertness level-off.[17] This means that an individual who is sleep deprived becomes less aware of how their performance has been impaired, in much the same way that a person who is intoxicated does not realise many of their cognitive and physical abilities are compromised.[18]

Fortunately, wellness programs that recognise the importance of sleep are being developed to support nurses. These programs are important to promote nurses' health and are strongly associated with patient safety and workforce sustainability.[1,19-21] In Victoria, Australia, the six-week 'Happy People at Work' program, which promotes energy, mood, stress reduction, and sleep was piloted in 2017 among 874 nurses and midwives.[22] The trial found 59% of 807 respondents reported that they gained strategies to help with sleep, although many (45%) reported that they were still learning how to effectively apply strategies. With the exception of sleep duration, the trial did not result in any significant differences in self-reported sleep parameters. This pilot program seems to support the usefulness of a wellness intervention, but also perhaps highlights a deficiency in sleep knowledge, as well as challenges associated with implementing strategies that promote sleep.

There are thoughts that strategies to promote wellbeing and resilience should be developed early in a nurse's career.[1] However, many of these initiatives fail to identify the importance of sleep despite growing concerns of poor sleep during the graduate nurse year.[1] In a recent study of 88 newly graduated nurses working in a tertiary hospital in South Korea, Kim and Lee found a significant decline in subjective sleep quality over the first four months of undertaking shift work as a nurse, which was associated with a decline in quality of life.[23] Similarly, Donovan and colleagues reported emotional, physical and mental exhaustion was often attributed to sleep deprivation during the graduate year of nursing and midwifery.[24] Epstein and colleagues also explored sleep during the graduate year and found graduate nurses had limited and potentially counterproductive strategies to cope with fatigue.[25] Whether poor sleep continues, worsens, or improves during the nursing career remains unclear. It is possible that nurses who receive sleep education early in their undergraduate training may be less likely to experience poor sleep during their graduate year and future career.

To date, efforts to embed sleep education in the undergraduate curriculum of healthcare workers have largely focused on medical clinicians and medical students.[26] Understanding the importance of sleep and strategies to achieve a good night's sleep is particularly important for nurses because it is often not common knowledge and strategies for non-shift workers are often publicised. Not all strategies to promote a good night's sleep are realistic or feasible for a person undertaking shift work. For a nurse experiencing poor sleep, this may result in the development of counterproductive strategies or acceptance of poor sleep as a way of life. However, some strategies can be modified, and other strategies can be implemented to help a person undertaking shift work achieve better sleep. Given the importance of sleep for nurses and thoughts that sleep patterns and burnout may have origins at the student level, research is underway to explore these areas of interest to enhance student and new graduate nurses' awareness of sleep and its influences on health and work.

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EDITORIAL

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RESEARCH ARTICLES

Nurse-led study on treatment delay and streamlining antibiotic therapy among haematology patients with febrile neutropenia post chemotherapy

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ABSTRACT

Objective: The aim of the study is to identify gaps that exist among health professionals that may impact practices in caring effectively for patients with febrile neutropenia (FN).

Background: Haematology patients with FN following chemotherapy frequently experience delays in antibiotic administration that may be linked to poorer clinical outcomes. To aid timely review and treatment, FN care pathways have been developed. However, observations of clinical practice and patient anecdotal reports have highlighted that the care pathways may not be adhered to. The impact on patient care outcomes due to treatment delays and the rate of protocol adherence to the FN management pathway is unknown due to insufficient evidence.

Methods: Using the Clinical Records Integrated System (CRIS), data were collected by auditing patients' electronic health records (EHR) from November 2017 through to November 2018. Information retrieved were screened using the inclusion and exclusion criteria.

Inclusion criteria: Haematology patients with FN (temperature ≥ 38° and neutrophil count < 1.0 x10^9/L) post chemotherapy, and 18 years or older.

Exclusion criteria: Medical oncology patients and patients who were under 17 years old.

Results: The mean time for antibiotic administration from first temperature spike was 90±15 minutes for inpatients (n=48). The mean time for antibiotic administration from medical officer review was

significantly lower at 48±5 minutes for outpatients (n=31). Inpatients who were given antibiotics within 60 minutes or less of their first temperature spike, their mean length of total stay in the ward was 17±1 whilst inpatients who were given antibiotics 60 minutes after their first temperature spike, the mean length of their hospital stay was slightly greater at 21±3 days. Outpatients who were given antibiotics within 60 minutes or less of their first temperature spike, their mean length of stay was 12±2 days. For outpatients given antibiotics 60 minutes after their first temperature spike, their mean length of hospital stay was slightly shorter at 9±3 days.

Conclusion: The study identified antibiotic delays among inpatient population, and with correlation to increased length of hospital stay and mortality. Another key factor identified in the study was delayed medical officer review although reasons for delays are outside the scope of this study to report.

What is already known:
- Febrile neutropenia is a serious and life-threatening illness.
- Delays in antibiotic administration exists among healthcare facilities.
- Adherence to FN treatment guidelines among healthcare settings are challenging.

What this review adds:
- Standardised orders to allow timely administration of antibiotic therapy that may reduce morbidity and mortality.
- Increased education on the seriousness and outcome from delayed antibiotics to patients, families, and healthcare staff.
- Further studies are required to standardise the clinical pathway and make antibiotics accessible for prompt delivery.

Keywords: chemotherapy, cancer, febrile neutropenia, haematology malignancies, myelosuppression, neutropenia.

INTRODUCTION

Febrile Neutropenia (FN) following chemotherapy is a life-threatening condition which may result in significant morbidity or death.[1] FN occurs in an estimated 10–50% of patients with solid tumours or lymphomas and in more than 80% of patients with haematological cancers.[2] Mortality rates from FN are reported at 10-20% with gram negative bacteraemia identified in this cohort of patients.[3] According to the FN management pathway via the ACT Heath Policy Register,[4] FN is defined as a rise in temperature of 38°celsius or greater and an absolute neutrophil count of 1.0 x10^9/L or less than 0.5 x 10^9/L. Further, FN is an oncological emergency requiring urgent medical attention. The definition of FN varies across institutions and states.[5] An alternative definition regards FN as a temperature of 38.3° celsius and/or a neutrophil count of <1.5 x 10^9/L.[61] For the purpose of this study, the definition from the FN management pathway will be used.[4]

Presenting with a fever and low neutrophil count (neutropenia) is an early warning sign of severe sepsis. It is also important to note that neutropenia can also be present in the absence of pyrexia. Hypothermia and hypotension in combination with neutropenia can lead to severe sepsis.[5] Medical and nursing staff need to be aware of all signs indicating sepsis, and act promptly.[7] The FN pathway advises urgent review by a senior medical officer (Registrar).[4] The pathway calls for blood cultures (i.e., peripherally and via central venous catheters) and administration of broad-spectrum antibiotic B-lactam such as Piperacillin Tazobactam.[8] Further examinations and tests are required as part of the treatment pathway. Any delay in the commencement of antibiotic may lead to life-threatening complications causing increased morbidity and mortality.[9]

The incidence and mortality rates of FN vary and are dependent on the type of malignancy and the chemotherapy treatment regimen being used.[10] For example, Acute Myeloid Leukaemia (AML) contain long intensive and high doses of chemotherapy which lead to severe neutropenia. Shorter and less aggressive treatment regimen used on other malignancies such as ovarian, prostate or lung can anticipate a less impact on the bone marrow function.[9] Nonetheless, FN is a serious complication and often proves challenging to diagnose and treat effectively. Further studies surrounding FN report the significant impact of this condition leads to high costs of care due to the requirement of intensive care thus leading to long hospital stays. Furthermore, the increased need for physical and mental rehabilitation and the impact of family and quality of life has also been highlighted.[2] All these occur within the background of workforce shortage issues, budgetary constraints and expertise and skills imbalances within inpatient settings.[8]

AIM

The aim of the study is to identify the gaps that exist among health professionals that may impact practices in caring effectively for patients with febrile neutropenia (FN). Knowledge gaps will be assessed by evaluating the current management of FN among haematology patients following

chemotherapy. This will provide information about staff behaviours, and potential gaps in knowledge and practice.

The following questions will be addressed:

- What is known about the time required to administer antibiotics to patients presenting with fever in the background of neutropenia?
- What is the rate of FN protocol adherence in the treatment of patients with FN?
- Is there an impact on patient outcomes where there are delays between temperature spike and the time of antibiotic administration?

STUDY DESIGN

DESIGN

Retrospective patients EHR Audit Between November 2017 to November 2018. Ethics approval for the study was obtained from the ACT Health Human Research Ethics Committee with study number *2018/ETH00606*. Patient information were stored and secured in designated laptop with patient details de-identified to maintain patient confidentiality and privacy and in line with ACT Health ethics requirements.

INCLUSION AND EXCLUSION CRITERIA

Outpatients (emergency department and Rapid Assessment Unit (RAU)) and inpatient haematology patients with FN (temperature greater than 38 and neutrophil count less than 1.0 $x10^9$/L) post chemotherapy and are 18 years or older. Inpatients are patients on the ward admitted for chemotherapy, while outpatients are patients who were sent home following chemotherapy and continuing to receive care through the community and outpatient cancer services. Oncology patients and patients who were 17 years old or under were excluded from the study. Neutrophil count >$1.0x10^9$ was also an exclusion criterion for outpatient however, this was added during the EHR auditing.

METHOD

Patient files were accessed through the Clinical Record Integration System (CRIS) records. Data collection focused on type of admission (inpatient or outpatient), demographics including age, gender, admission, and discharge dates, hematological malignancy, type of chemotherapy, as well as outcomes such as time of temperature spike if inpatient, or time of first medical officer review if outpatient, time of antibiotic administration, neutrophil count, temperature reading, blood culture result and discharge location. Since outpatients were admitted with elevated temperature from home, time difference from initial spike to antibiotic administration could not be measured. Time of first medical officer review was chosen as a comparable measure to first temperature spike with inpatients as both processes represent the first stage of the FN management found in the ACT Health Policy Register (2018).

After compiling the data from patients who had a visit from November 2017 to November 2018, inpatients with incomplete medication chart, or spiked at home were excluded (n=38). Similarly, outpatients who had incomplete medication chart, no time stamp for first medical officer review, had a temperature reading of under 38 degrees were excluded (n=42).

A total of 167 patient records were left for further screening. After exclusion, inpatient (n=48) and outpatient (n=31) data were separated, mean, median and the range interquartile (75^{th} percentile minus 25^{th} percentile) for time to antibiotic administration was calculated, as well as the overall protocol adherence rate was calculated. Protocol adherence was defined as measuring all the following data points: temperature, carrying out blood culture, urine collection and chest x-ray. If all these procedures were documented, a "yes" score was assigned and if any one of these procedures were not documented, a "no" score was assigned. Percentage of "yes" protocol adherence was determined.

To determine consequences of delayed antibiotic administration, both inpatients and outpatient data was sorted into two further groups, one with antibiotic administration less than 60 minutes from initial temperature spike (under 60min) and the other group with antibiotic administration given greater than 60 minutes from initial temperature spike (over 60min). Outcomes such as length of stay (discharge date minus admission date), ICU admission (yes or no), positive blood culture result, and mortality rate (number of patients died under febrile neutropenia management over patients that returned home) was determined.

The inclusion criteria and protocol adherence were all based upon the Flow Chart for Haematology Oncology Patients (Figure 1). All statistical analysis was performed using Graphpad-PRISM 8. Unless otherwise indicated, data are presented as means with error bars representing standard error of mean (SEM).

PARTICIPANT DEMOGRAPHICS

The mean age for patients in this study was 61 years (26 to 85 years) with 59% males and 41% females. This demographic profile is consistent with the demographics in other FN studies.[11-13] The top three haematological malignancies the patients had were Acute Myeloid Leukemia (AML), Multiple Myeloma (MM) and Mantle Cell Lymphoma, with 61% of the patients being inpatients. Patient demographics are detailed in Table 1.

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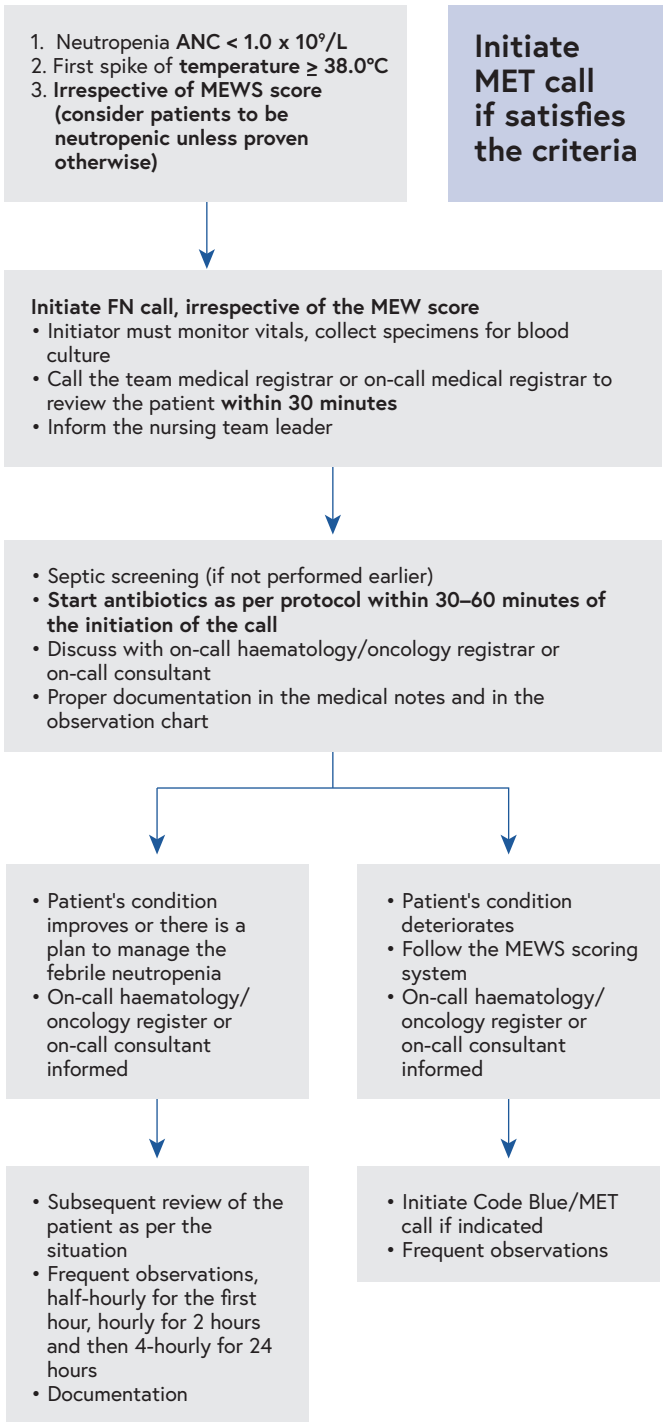

FIGURE 1: FLOW CHART FOR THE MANAGEMENT OF FEBRILE NEUTROPENIA

Retrieved via ACT Health. (2022). Canberra Hospital and Health Services Clinical Guideline: *Febrile Neutropenia Management*.

TABLE 1: PATIENT DEMOGRAPHICS

Patient Demographics (n=79)		
Age range		26-85 years
Mean Age		61 years
Gender		
Male	59%	(n=47)
Female	41%	(n=32)
Admission		
Inpatient	61%	(n=48)
Outpatient	39%	(n=31)
Haematological malignancy		
Acute Myeloid Leukaemia	29%	(n=23)
Multiple Myeloma	21.5%	(n=17)
Mantle Cell Lymphoma	11%	(n=9)
Non-Hodgkin's Lymphoma	5%	(n=4)
Acute Lymphocytic Leukaemia	4%	(n=3)
Chronic Lymphocytic Leukaemia	4%	(n=3)
Follicular Lymphoma	4%	(n=3)
Other	21.5%	(n=17)

RESULTS

Following the diagnosis of FN, a broad-spectrum antibiotic should be administered within 30-60 minutes (Figure 1). What this also means is that broad-spectrum antibiotics must be administered within 30-60mins following fever detection. To determine the current performance of nursing and medical staff at Canberra Health Services (CHS) in following the FN pathway, we measured time taken for patient to develop fever and the time taken for antibiotic administration. The mean time for antibiotic administration from first temperature spike was recorded at 90±15minutes for inpatients (n=48) (Figure 2). The mean time for antibiotic administration from medical officer review time was significantly lower at 48±5minutes for outpatients (n=31). Time taken for antibiotic administration from first temperature spike was significantly greater in inpatients compared to outpatients, ($p<0.05$) (Figure 2). For outpatients, the time for antibiotic administration ranged from 0 and 115 minutes respectively, with a median time of 48 minutes.

The mean time for antibiotic administration from first temperature spike was recorded at 90±15minutes for inpatients (n=48). The mean time for antibiotic administration from medical officer review time was significantly lower at 48±5minutes for outpatients (n=31). Time taken for antibiotic administration from first temperature spike was significantly greater in inpatients compared to outpatients, *Unpaired Student's T test*,$p<0.05$.

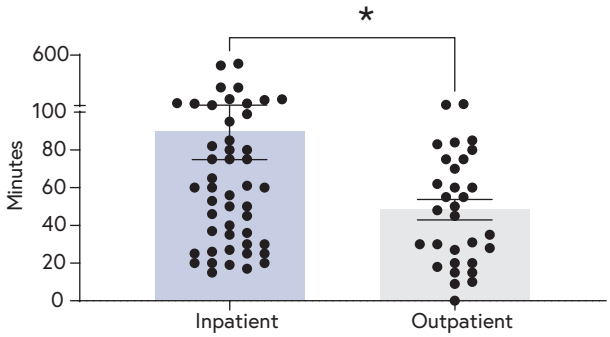

FIGURE 2: TIME OF TEMPERATURE SPIKE TO TIME OF ANTIBIOTIC ADMINISTRATION

IMPACT OF DELAYED ANTIBIOTIC THERAPY

To determine whether delayed antibiotic administration resulted in increased length of hospital stay, a comparison was made between patients with antibiotic therapy over 60 minutes and patients with antibiotic therapy under 60 minutes (figures 3A and 3B). For inpatients given antibiotics under 60 minutes, the mean length of hospital stay was 17±1days (n=25) whereas inpatients given antibiotics over 60 minutes, the mean length of hospital stay was slightly greater at 21±3 days (n=22). For inpatients, 23 (n=48) patients were outside the 60 minute window and 10 (n=31) patients from outpatients were outside the 60 minute window.

For outpatients who received antibiotics under 60 minutes, the mean length of hospital stay was 12±2 days (n=21) while the mean length of hospital stay was slightly short at 9±3days for patients who received antibiotics over 60 minutes. It is not known why patients with delayed antibiotic therapy showed a shorter length of stay compared to those within the recommended 60 minutes. Whilst this finding may seem anomalous, the result was not considered statistically significant [p<0.05].

For inpatients who were given antibiotics under 60 minutes, their mean length of hospital stay was **17±1days** (n=25). For inpatients who were given antibiotics over 60 minutes, their mean length of hospital stay was slightly greater at **21±3 days** (n=22), however not significant (ns, *Unpaired Student's T test* p>0.05).

To determine further complications of delayed antibiotics administration, patient outcomes such as ICU admission rate, positive blood culture rate and mortality rate were determined (Table 2). Our analysis revealed the ICU admission rate for inpatients who received antibiotics over 60 minutes compared to patients who received antibiotics under 60 minutes from FN increased from 4 to 19%. Similarly, mortality rate increased to 9% for inpatients who received antibiotics over 60 minutes from 4% for inpatients who received antibiotics in under 60 minutes. Positive blood culture rate did not increase due to delayed antibiotics administration for inpatients. No outcomes increased for outpatients due to delayed antibiotics administration.

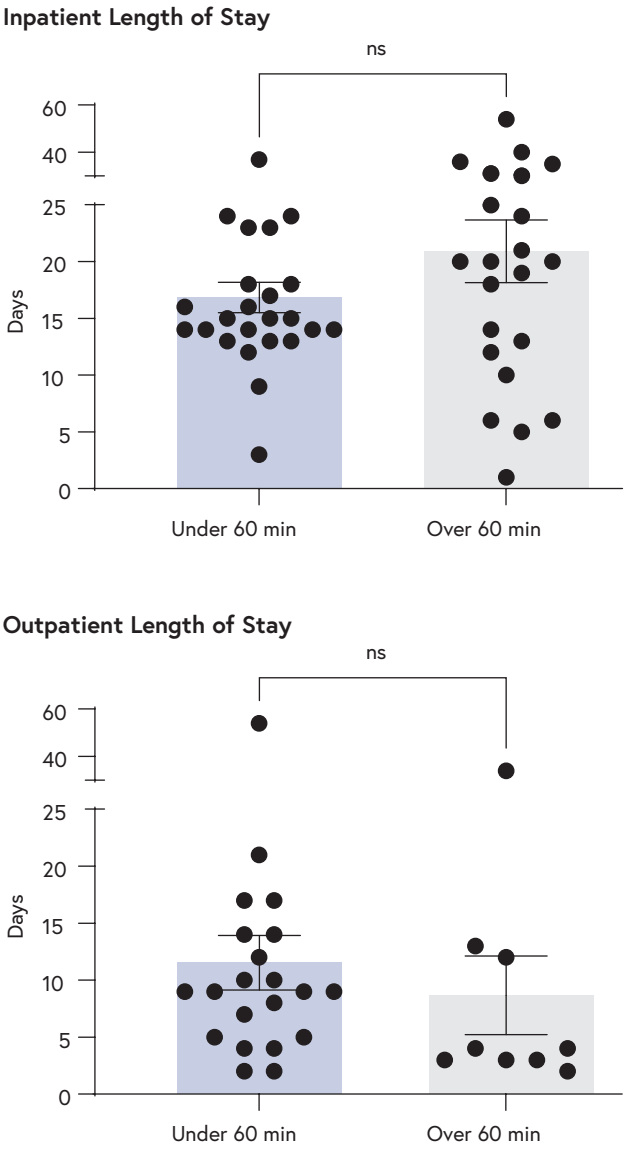

FIGURE 3: INPATIENT AND OUTPATIENT LENGTH OF HOSPITAL STAY (LOS)

In addition, the overall FN protocol adherence rate for both inpatients and outpatients were calculated which was recorded at 94 and 91% respectively. The only exception for not getting 100% protocol adherence rate was due to delayed antibiotics and unclear patient notes which did not clearly show blood culture or post work up notes and hence could not be deemed as following protocol adherence.

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TABLE 2: PATIENT OUTCOMES

Patient Outcomes (n=79)		
ICU Admission		
Inpatients (under 60min)	4%	(n=3)
Inpatients (over 60min)	19%	(n=15)
Outpatients (under 60min)	14%	(n=11)
Outpatients (over 60min)	10%	(n=8)
Positive Blood Culture		
Inpatients (under 60min)	60%	(n=47)
Inpatients (over 60min)	43%	(n=34)
Outpatients (under 60min)	35%	(n=28)
Outpatients (over 60min)	20%	(n=16)
Mortality Rate		
Inpatients (under 60min)	4%	(n=3)
Inpatients (over 60min)	9%	(n=7)
Outpatient (under 60min)	0%	(n=0)
Outpatient (over 60min)	0%	(n=0)
Overall Protocol Adherence		
Inpatient	94%	(n=74)
Outpatient	91%	(n=72)

DISCUSSION

DELAYS IN ANTIBIOTIC ADMINISTRATION

This study identified delays in administration of broad-spectrum antibiotic therapy to inpatients with FN. The mean time of 90±15 minutes in delay were clearly outside the 30-60 minutes timeframe as stated in the CHS FN ACT Health Policy Register (2018).[4] Most of the delays occurred within the inpatient haematology area and is of concern, as this is an area with specialised skilled nursing and medical staff who are easily accessible during business hours. Factors causing the delays were beyond the scope of this study and thus not examined. However, lack of awareness, high patient acuity, delays in medical officer review, poor staffing and/or clinical skills among nursing and medical staff are believed to be the main contributing factors resulting in delays in this study. Similarly, a previous study also reported similar reasons for delays in broad-spectrum antibiotic administration.[5] Increasing awareness of the FN pathway among medical staff to ensure appropriate review and care escalation were highlighted as important aspects in improving protocol adherence in their study.[5] Mean time for broad-spectrum antibiotic administration from medical officer review time was significantly lower at 48±5 minutes for outpatients. The reason/s for a lower mean time in broad-spectrum antibiotic administration for outpatient compared to inpatient may have been due to the effective use of the triage system in ED, access to medical officer and their ability to prescribe broad-spectrum antibiotic in the outpatient clinics. Whereas for inpatients, access to medical officer for appropriate and timely care and treatment can be challenging due to number of factors. Busy workload among nursing staff due to high patient acuity, absence of medical officers due to ward rounds and/or meetings, and inadequate skill mix, all impact on staff ability to perform physical examination, blood sampling and administration of broad-spectrum antibiotics. The increase mean time for broad-spectrum antibiotic administration, have the potential to impact on patient outcome.

PATIENT OUTCOME

Previous studies have found a correlation between delayed antibiotics and patients being admitted to ICU.[5,14] Similarly, the present study found that 19% of inpatients who had antibiotics administered over the 60 minutes timescale were admitted into ICU, compared to those under 60 minutes. Similar findings were reported for patients in the outpatient areas where 10% of patients given antibiotics over 60 minutes were also admitted into ICU. It is unclear if the admissions into ICU were a direct result of delayed antibiotic administration. Patients admitted into ICU showed neutrophil levels ranging from 0.01 – 0.08 x10^9/L and with haematological malignancies identified as Acute Myeloid Leukaemia (AML), Multiple Myeloma (MM) and Lymphoma. The chemotherapy treatment protocols linked to these patients were Melphalan (as part of the autologous stem cell transplant), GRAALL, Flag-Amsacrine, R-CHOP + BEAM, 7'3 Induction, HIDAC and ICE. Severe and prolonged neutropenia from these high-risk chemotherapy protocols lead to FN thus delaying or a reduction in treatment dosages.[15] These influence long-term survival.[14] Granulocyte colony-stimulating factors (G-CSF) is included in these chemotherapy protocols to support white cell recovery, particularly the neutrophils.[6] But GCS-F may not prevent ICU admission or mortality rate as complications from these high-risk chemotherapy protocols and other comorbidities can have a life-threatening consequence on a FN patient. Timely and evidence-based treatment approaches are crucial to ensure supportive medications such as G-CSF and appropriate antibiotics are used to reduce LOS and promote faster recovery from the neutropenic phase.[6]

Blood culture samples collected from both inpatients and outpatients showed a range of both gram-negative and gram-positive organisms. These were seen in patients with under and over 60 minute timeframes. The main gram-negative organisms seen in this study were: *Escherichia coli, klebsiella, pseudomonas aeruginosa, Enterobacter cloaca,* and *Enterococcus faecium.* Gram-negative bacteraemia is common among immunosuppressed patients and is associated with high overall morbidity and mortality.[3] Gram-positive organisms were *streptococci, staphylococcus, streptococcus oralis/ salivaries/viridans, and staphylococcus epidermis/ aureus.* Recent evidence reported that extended spectrum beta-lactamase (ESBL) producing *Escherichia Coli (E coli)* are an increasing

issue among haematological malignancies. Other multiple drug resistant bacteria (MDR) are *enterococcus faecium*, *Staphylococcus aureus, klebsiella pneumoniae, Acinetobacter baumannii,* and *Pseudomonas aeruginosa*. It is believed that the prevalence and pattern of resistance varies among different health institutions.[3] Bloodstream infections in FN patients in developed countries were understood to be caused by gram-negative organisms. This may perhaps be due to infrequent use of central lines and prophylactic antibiotics. However, last decade or more, has seen the return of gram-positive pathogens predominantly with coagulase-negative staphylococci (CoNS) remaining as the cause of bacteraemia.[3] Nonetheless, FN patients with a positive culture increases the risk of developing life-threatening complications and consequently death.

Patients from this current study who had antibiotics under the 60 minute timeframe had a mortality rate of 4% while patients who had antibiotics over the 60 minute period had a 9% mortality rate. This is a correlation between broad-spectrum antibiotics given over 60 minutes and mortality rate.

This finding is similar to another study who examined 307 cases of FN and found 29 deaths.[16] The study identified that time to antibiotic administration (TTA) was independently associated with mortality within a month period (28 days)[16]. Delays in antibiotic administration by an hour increased the risk of mortality within 28 days by 18%.[16] These findings are significant and demonstrate the importance of urgent intervention to FN patients.

LENGTH OF HOSPITAL STAY

The study found that inpatients who received antibiotics over the 60 minutes experienced an increase in hospital length of stay (LOS), of four days compared with the group who received antibiotic therapy under 60 minutes, however the difference was not statistically significant. In current hospital settings, LOS is regarded as an important indicator in better understanding of the clinical severity experienced by patients and the number of resources needed to ensure effective care.[16] The issue among FN patients with increased LOS are placing themselves at an increasing risk of developing hospital acquired infections, delays in their antineoplastic treatments which in turn, have further implications for cancer treatment outcomes. Furthermore, given that diagnostic and treatment procedures in patients with FN are often associated with large financial expenditures, increased LOS negatively impacts on healthcare resource use and costs. Financial burden on the healthcare system due to increased use of medications, cost on beds and the overall cost on patients and their families is well established.[5,16] Evidence show that the median cost to run a specialised centre is phenomenal with the median cost of hospitalisation per episode of FN may potentially be as high as $24,000 USD ($33,404 AUD).[16] In the current study, there were 79 FN patients and each patient required hospitalisation, with some patients getting admitted into ICU. Based on Rose and Goldani's study calculations, the average hospitalisation cost for all 79 FN patients would roughly be $2,638,966.56 AUD. The care and treatment for patients suffering from sepsis is expensive. For a more accurate cost analysis and more up to date costing by a health economist within the Australian healthcare system would be required as costs vary from one health institution to another.

By understanding the factors that prolong LOS in patients with FN and the financial burden on the healthcare system, perhaps our ability to improve practice for better patient outcome therefore cost effective can be less challenging. We are also improving the quality of life among our most vulnerable patients.

FN TREATMENT PROTOCOL ADHERENCE

Evidence-based guidelines such as the Sepsis Kills Program, Australian Sepsis Network, the National Comprehensive Cancer Network (NCCN), and the Infectious Diseases Society of America (IDSA) all recommend prompt intervention among FN patients.[7,9,17] These guidelines provide clear and detailed information to ensure timely administration of treatment. The overall protocol adherence rate for inpatient was 94% while outpatient was 91%. However, an American study found high rates of poor practice (>96% non-adherence in low-risk patients) in outpatient management consequently resulting in inappropriate hospital admissions and over-prescription of antibiotics such as Vancomycin.[18] Adherence rates elsewhere in Australia is not clearly known. Current management of FN requires urgent review by a senior medical officer (registrar), blood culture sampling and other routine bloods are taken immediately prior to commencing antibiotic. Other tests samples such as urine, stool, sputum and/or swabs are required but not required urgently. A chest x-ray is also required as part of the physical examination. We found that most of the FN patients from the study had all steps in the pathway followed. This resulted in high adherence rate. However, issues that came out of the study were that a junior medical officer was noted to have reviewed the FN patients and not the senior medical officer (registrar). Delays were caused because of delay from the medical officer review therefore delay in prescribing the antibiotic. Further examination of current practice within the hospital system must occur to better understand knowledge and skills gaps among nursing and medical staff specifically to those within specialty areas.

The NCCN recommend the use of the Multinational Association for Supportive Care in Cancer (MASCC) Risk Index. However, it is unclear if the MASCC risk index is utilised appropriately during discharge planning following chemotherapy. Clinical settings such as a haematology wards dealing with patients following chemotherapy and stem cell transplants demand the use of MASCC risk index

for thorough risk assessment and appropriate prescribing of antibiotics. Further, safe discharge planning means that patients have preventive measures in place to avoid unwanted complications, thus returning to the hospital.[19]

STUDY LIMITATIONS

A change in the hospital documentation system during this study changed how information was stored and recorded. There was a change from paper charts to computer-based where all patient information was recorded on the computer. The study was further complicated with various electronic systems being used throughout the hospital. Areas within the hospital such as ICU and ED had their own systems for recording and storing patient clinical data. This made it challenging to retrieve information as accessing these different systems required individualised passwords to be set-up in addition to learning how to use the different systems. As highlighted in the exclusion criterion (Table 3), unclear medication information including time for temperature spike was a major problem across both inpatient and outpatient groups.

Future studies will be greatly improved with a universal patient record management system which requires nursing staff and/or medical officers to record time of temperature spike, time for antibiotic administration, type of antibiotic given. The NCCN recommend the use of the Multinational Association for Supportive Care in Cancer (MASCC) Risk Index. However, it is unclear if MASCC is utilised appropriately during discharge planning following chemotherapy. Research into the utilisation of MASCC and review of current FN pathway are needed to ensure evidence-based information. Structured and consistent education sessions is vital among nursing, medical staff, and the after-hours medical team to increase awareness.

CONCLUSION

The study identified antibiotic delays among inpatient population, and with correlation to increased length of hospital stay and mortality. Another key factor identified in the study was delayed medical officer review although reasons for delays are outside the scope of this study to report. There is a significant need for change of practice and in the way we manage patients experiencing FN within the hospital and cancer outpatient centres. Strategies to enhance staff response and care to patients with FN for a positive healthcare outcome is warranted. Increased education concerning the seriousness and outcome from delayed antibiotics need to be delivered to patients, families, and staff. Further research into the barriers impacting on the effective delivery of care to FN throughout the organisation needs to be examined. FN is a life-threatening condition and prompt response can save lives. This study has presented true, reliable, and genuine evidence from a small sample size, and from a single tertiary health organisation. The evidence gathered from this study needs to contribute to change in practice not only within the organisation but also within the community.

IMPLICATIONS FOR RESEARCH, POLICY, AND PRACTICE

REDUCING TIME FOR ANTIBIOTIC ADMINISTRATION FOR FN PATIENTS

Delays in antibiotic administration were identified in this study. Delay in patient review by medical officer at time of call could be understood as one of the reasons for delays in antibiotic administrations based on the recommendations stated in the FN treatment pathway. The role of nurses in the treatment delays could not be assessed as not part of the study objective. However, increasing staff awareness of FN and access to FN pathway is a starting point among medical officers and nurses to improve care. A development of a standing order for the appropriate antibiotic could reduce the waiting time and patients can be treated immediately. FN algorithms and treatment guidelines need to be made accessible to nursing staff to be aware of their role in caring for FN patients.

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RESEARCH ARTICLES

Understanding COPD Emergency Department presentations: using thematic analysis to explore the voices of patients, nurses, and doctors on the lived experience of managing COPD

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ABSTRACT

Aim: To describe for areas of improvement in the management of COPD and reduction in emergency department presentations in Queensland.

Background: If current trends in the management of COPD do not change, the predicted 4.5 million Australians diagnosed with COPD by 2050 will place significant burdens on already over-utilised frontline ED services. Separately COPD is more costly per case than cardiovascular disease and is a more common presentation to Emergency Departments in any year than most types of cancer, road traffic accidents and heart disease.

Study Design and Methods: This study used a qualitative thematic analysis methodology in which field convergent interviews were employed to generate data. Sixteen staff and nine patients across three major Southern Queensland Health acute care facilities participated in the study. The authors analysed interview data using qualitative thematic analysis.

Results: This research has revealed several noteworthy concepts worthy of further exploration. Thematic analysis from both staff and patient interviews identified the following issues:

1. Nurse case management, 2. Integrated communication of patient assessment and history data, 3. Failure in COPD management, and 4. Knowledge utilisation among ED clinicians. Inherent among these key concepts is a primary goal of coordinated congruent COPD management that optimise a patient's functional status and quality of life, improving symptoms management, and avoiding recurrent exacerbations.

Discussion: These insights into the experience of patients and hospital staff into the management of COPD provides valuable insight into current and desired practices that can help to minimise presentations to Emergency Departments. The findings of the research provide insights and future direction for improvements by addressing the inconsistency in disease management. The need for more accessible and consistent patient management and a more congruent centralised patient support framework was also identified.

Conclusion: There is indication of support stemming from the voices of patients and hospital staff around the need for COPD case management to become the dominant method of care. Future research should consider the cost benefit and patient outcomes of the implementation of such a role and the avoidance of ED presentations.

Implications for research, policy, and practice: The findings of this research imply a need to streamline the patient support and disease management discharged planning process by ensuring one health professional maintains ongoing education, support, and assessment to the patient. Future research needs to better ascertain the positive economic benefits to healthcare organisations by employing Case Managers for patients with COPD.

What is already known about the topic?

- Case management roles can be effective in reducing ED usage for adults with chronic illnesses.
- The World Health Organization (WHO) has called for planned ongoing assessment, care and support coordinated by a proactive investment in real time solutions that address the increasing burden of this disease on the healthcare sector.
- The WHO has endorsed targeted patient support strategies that coordinate care over time, addressing the physical and mental health needs of people with chronic illness.

What this paper adds:

- Findings from this research show that discharged planning support practices with Southern Queensland Healthcare Organisations require review and ongoing evaluation.
- This may include, streamlining the patient support and disease management discharged planning; or designated case management or integration of systems to prevent ED presentations.
- This research adds to the voices of patients and staff that confirm published research recommendations.

Keywords: Chronic Obstructive Pulmonary Disease, Emergency Department, Discharge Planning

BACKGROUND

Chronic Obstructive Pulmonary Disease (COPD) contributes to high levels of morbidity and mortality nationally and internationally. The lung disease is ranked as the fourth leading cause of death globally and the leading cause of health burden in Australia within an ageing population.[1-3] COPD is characterised by progressive and irreversible airway obstruction. Over 2.1 million Australians have COPD. Of these over 1.2 million people will have a sufficiently progressed stage of COPD that it is already affecting activities of daily living.[3,4] There are four stages (I to IV) of COPD based on FeV1 spirometry results which rank the condition in terms of severity, with IV being the most severe.[5,6] Approximately 876,000 Australians have Stage I COPD,[7] many of whom will progress to develop more severe COPD if left unrecognised and untreated. Lack of utilisation of spirometry being gold standard to confirm diagnosis has led to underdiagnosis and presence of other comorbidities has led to misdiagnosis.[8-10] Fifty seven percent of those with COPD are women. Among people with COPD, 47% are of working age (15-64 years) and 62% are over 60 years. Underdiagnosis, misdiagnosis and comorbidities are a major issue with COPD. Symptoms for another condition, such as Chronic Heart Failure is one of the factors associated with misdiagnosis.[7,10] Medication compliance has also been recognised as a key contributor to Emergency Department (ED) presentations.[11] If current trends do not change, the predicted 4.5 million Australians diagnosed with COPD by 2050 will place significant burdens on already over-utilised frontline ED services, particularly when considering an ageing population and comorbidity with other conditions.[12] Separately COPD is more costly per case than cardiovascular disease and is a more common presentation to Emergency Departments in any year than most types of cancer, road traffic accidents and heart disease.[7,12,13] A recent Australian study found that the average

daily cost of a COPD admission was A$8,297.[12] The World Health Organization has documented over 251 million cases of COPD internationally in 2016 and approximated COPD contributed to 5% of all global deaths.[11] In Australia, one in seven people aged 40 years and over have some form of COPD and the rate of hospitalisation for COPD among those aged 55 and over was 1,052 per 100,000 in 2015.[14] The Australian Institute of Health and Welfare indicate that poorly managed COPD is one of the top two causes of avoidable hospital presentations and is increasing.[1] International evidence surrounding chronic disease presentations has revealed that moving from reactive management to proactive management with improved communication demonstrated an increase in complex specialist nursing interventions and led to a decrease in emergency presentations and bed use at local hospitals.[3,7,15-17] A systematic review conducted in 2016 confirmed from several empirical studies that case management roles can be effective in reducing ED usage for adults with chronic illnesses.[18] The WHO has called for planned ongoing assessment, care and support coordinated by a proactive investment in real time solutions that address the increasing burden of this disease on the healthcare sector. WHO has endorsed targeted patient support strategies that coordinates care over time, addressing the physical and mental health needs of people with chronic illness.[19] A scoping review by Moloney et al. (2019) confirmed that future research should target ED avoidance with a stronger emphasis on coordinated community management.[20]

PURPOSE OR AIMS

This project entailed qualitative interviews with 12 staff and nine patients across three major Queensland Health (QH) sites, both metropolitan and regional. This study explored the perspectives of key healthcare stakeholders related to the reasons for COPD ED presentations. It asked these key stakeholders to offer insight into potential barriers and inefficiencies related to ED presentations, whilst highlighting some targeted ED avoidance recommendations.

STUDY DESIGN AND METHODS

Thematic analysis was chosen to facilitate an understanding of the clinical experience of key stakeholders in order to appreciate hidden details behind COPD presentations to an ED, and the adaptation of meaning of managing COPD for the participants. Numerous studies focusing patient experiences of living with COPD have been guided by a qualitative thematic analysis design.[21-23] Ethical approval was obtained from the Human Research Ethics Committee of the Queensland Health service where participants were working or were admitted (HREC/17/QGC/249). Informed written consent was obtained prior to participation, and participants were advised of their right to withdraw without penalty or prejudice at any time. Participants were recruited from three nominated sites in South Queensland via purposive sampling. Participants included nine registered nurses, two respiratory physicians, five emergency department clinicians and nine patients with COPD. Upon presentation to ED, patient sample participants were invited by health staff to be interviewed by members of the research team. Similarly, staff working in the ED were invited to be interviewed by one of the members of the research team. Data was collected by a registered health professional (i.e., Nurse or Psychologist) with prior experience in COPD education and management, and with the research methodology. Using the technique of in-depth interviewing, the participant's lived experience, opinions, attitudes, ideas, and self-realisation were gathered. In-depth interviewing enabled deeper questioning by progressing a cyclical process through continuous analysis.[24,25] Interview prompts such as "tell me about your interpretation of current COPD management within the healthcare sector" were asked. Digital recordings from interviews were transcribed in a de-identified and precise manner. Copies of transcripts were verified with 50% of participants prior to analysis as supported in interviewing methods.[26] Written transcripts were dissected using line-by-line coding and consequential theme categorisation leading to the identification of core concepts.[27,28] In undertaking thematic analysis the researcher became familiar with the data, began to generate codes, undertook extensive searching for themes, revised emerging themes thereby further defining the themes and writing up the major themes for presentation.[29]

STUDY DESIGN AND METHODS

The notes were collated and analysed using principles of thematic analysis outlined by Braun and Clark.[23] This analysis required re-reading through the transcripts independently and multiple times to identify common themes. Findings were synthesised into dominant themes following researcher discussions with the team. An additional reviewer then reviewed the themes and only minor adjustments were made ensuring rigorous and accurate interpretation of the data.

The principal researcher (CM) is a clinical nurse with 27 years of experience working with patients exhibiting COPD. He also has a lived experience of a respiratory condition and is aware of the importance of a comprehensive management plan.

Each of the interviewers used a template of general interview questions. For staff questions included "What generally happens when a patient presented with an AECOPD", "what members of the multidisciplinary team are involved", "how is the GP involved" "does the patient leave with a COPD management plan". Patient interviews reflected the staff interview with questions such as "What happens when you present with an acute exacerbation of COPD", "what members of the multidisciplinary team are involved", "do you have a GP and are they involved", "have you been discharge with a management plan".

RESULTS

This research has revealed several noteworthy concepts worthy of further exploration. Thematic analysis from both staff and patient interviews identified the following issues: 1) Nurse case management, 2) Integrated communication of patient assessment and history data, 3) Failure in COPD management, and 4) Knowledge utilisation among ED clinicians. Inherent among these key concepts is a primary goal of coordinated congruent COPD management that optimise a patient's functional status and quality of life, improving symptoms management, and avoiding recurrent exacerbations.

LACK OF EFFECTIVE CASE MANAGEMENT

There was a strong consensus among patients and staff around the concept of lack of effective case management and fragmentation of care. Participants felt that the introduction of a nurse case manager might help patients avoid regular presentations, allow for alerts and warnings about adverse circumstances to patients (e.g., smoke from bush fires), and generally give more continuity and consistency in patient management. The strength of this concept is that it was mentioned by both staff and patients.

As one of the participating emergency nurses (Staff 1) expressed:

> *"So, I think from an ED management perspective it might be inefficient for an ED nurse to be only doing COPD, but it would make sense for a respiratory nurse or a case manager to assess COPD and be based in the ED. I think that would definitely help a lot of patients, definitely help the hospital, and in some respects may even assist in hospital avoidance".*

Staff member [1] further elaborated on the concept of Nurse Case Management saying:

> *"If, for example, people that live near this hospital, if there's planned burning, then if they have forewarning then they can take appropriate steps to reduce the risk of admissions. So those kinds of things would be helpful but would need a special team whose primary focus is COPD, and possibly asthma. There would need to have the ability to give out patients' certain instruments or devices for patients to be able to log on to their database and update symptoms, etc., and to have some person that they can contact and get feedback on as to what the next step there should be. So, it may be go to your GP* [General Practitioner], *take steroids and antibiotics, stay at home, or come into ED."*

In addition, one of the ED doctors (Staff 2) stated:

> *"I'd take a load of the layers out. I'd take a huge amount of the layers out, I would give the patient one case manager, and that same case manager every time, who is responsible for all that patient's referrals."*

Another participating nurse (Staff 3) suggested:

> *"One person who then liaises with the patient's GP, and who that patient calls, only one of them, that is the person who you* [The patient ring]*."*

One of the patients with COPD astutely expressed they would have liked:

> *"One person or single point of contact to coordinate my care."*

LACK OF INTEGRATED COMMUNICATION PROCESS

Both patients and staff thought that the communication process required some improvement. This communication related to discharge planning and patient follow-up requirements. Patients particularly wanted the communication to be more centralised with less stakeholders involved thereby making it more streamlined and simpler. They also wanted more timely communication to their GP. Staff also alluded to a need for centralised and consistent forms of communication, e.g., electronic over paper-based patient information.

As one example patient (6) alluded to a lack of communication to his GP stating:

> *"So, if you go and see your GP, a week later thinking he or she would have all the paperwork…but he sits there looking at me and says, I knew you were in the hospital because your wife left a message – I told her to do so. He said but I haven't got the report."*

Patient (3) alludes to confusing communication explaining:

> *"Actually, there's so many doctors and so many people that I've talked to about the airways about the lung, it's confusing. They all seem to come in at once and all the information gets all muddled up, up there."*

One of the Registered Nurses (RN; Staff 7) referred to the breakdown of patient information flow into the ED outlining:

> *"They were using paper records when we were using electronic, but that's all fixed. GP-wise - yeah, that's the obvious thing. We don't have access to their stuff. They do have access now, more often, to our stuff, so if it's important, in the right area. Yeah, we do spend a lot of time trying to get on to GPs, practice nurses, can you send us these?"*

Further to this theme another RN detailed:

> *"I think some of the other assessments that do get done in ED that I read are the - they call them the [arch] nurses, the ones that assess how they are at home and I see those in ED. It's hard for me just to guess what they do there because often it's not recorded in our medical records, which is tricky."*

One of the ED physicians (Staff 12) posited a solution by saying:

> *"They have their own system, and they will write things on paper which may be scanned in later. So, I'm looking at a patient that's in ED and I'll be reading what's written and I can only read what I can see, I can't see the piece of paper that they're writing on down there. I think that will change with* [IEMAR] *which starts on 1 April. So, they won't have a paper-based, where they write their vital signs, where they write what is happening with the patient, it will be all on* [IEMAR]*."*

PRACTICE GAP IN COPD MANAGEMENT

Self-management failures alluded to either patients recognising their own failures in seeking treatment early or actual patient risk situations that warrant improved preventative measures. Some patients were able to recognise a lack of recognition of early cues within their own condition, but only after reflection and hospital admission. Other patients attributed their re-exacerbation related to early discharge home, feeling they did not think they were ready. Other themes included lack of awareness as to the benefits of oxygen therapy, or in one case the availability of portable oxygen to allow timely transport and assessment by a GP.

Failures from a professional staff perspective were noted to be three main issues worth documenting for future consideration. The first related to the conditioned use of high flow oxygen therapy on CO_2 retainers by paramedics who respond to emergency call outs. The second related to the use of Non-Invasive Ventilation, with one ED physician feeling un-monitored NIV may contribute to increased length of stay upon hospital admission. Thirdly, health professional called for more supportive intervention, including psychological support for emergent anxiety and depression post discharge.

Patient (1) reflected on his own lack of response to a build-up of excess fluid saying:

> *"As I said, it was a slip up. I overlooked that build up. I went three kilos up in two days and stayed there for another day and I just didn't do anything about it, and it's my fault."*

Patient (3) referred to their one stubborn behaviour expressing:

> "*Now I know because the second time when I had the attack, I was gasping too but I still wouldn't ring the ambulance or get my sister to ring the ambos."*

One of the patients (Patient 4) referred to the quick turnaround from hospital as a contributing factor to a representation:

> *"Well, I've been in three times recently. I had one doctor that I saw the morning after I came into emergency and I was in one of the wards just near emergency, the holding ward type thing; and she sent me home and I knew I was crook; and I collapsed and came back. I think they do it to clear beds. Create more beds, that was my feeling, But I don't truly know that."*

One patient (Patient 4) through misguided interpretation of the effectiveness of oxygen therapy outlined:

> "*No. I've been asked* [about oxygen] *- I was virtually in hospital, it was considered in my case because I felt - I don't want to get on oxygen because to me it's the last thing; it's the start of the end. I've had a couple of friends go that way."*

Further related to the theme of oxygen one patient (Patient 7) outlined:

> *"No. I don't have portable oxygen. So, I've got to go without oxygen and get in the car. I've got to go there; I've got to get from the car to the surgery. I've got to sit in the surgery, walk to his office, walk back and then go out and get in the car and come home again. It's a drama."*

Two core issues were revealed from staff as risk management considerations for patients. One ED physician, Staff member (4) gave an example:

> *"Again, I'm talking about the small percentage of people who require Non-Invasive Ventilation. They're the high acuity patients. The problem with them is that if they're not managed initially, it adds another few days to their recovery in the long-term. Then there is the small chance that they may not actually improve because they have become so acidotic, so once their pH drops below seven, it's very hard to recover from that."*

Another respiratory physician gave a prime example of policy non-adherence which had contributed to admissions and patient complications on a number of occasions. Staff member (5) stated:

> *"It may not necessarily be an ED issue, but occasionally we have patients who have called the ambulance and said they're being short of breath, or the GP has done that, and the first thing that happens as soon as the ambulance staff sees the patient is well, this patient's hypoxic, and let's wack him on high flow oxygen and high Fio2. Once that happens, invariably by the time they've come into ED and resus, they're in dire straits or they're quite acidotic because they've gone into CO_2 retention."*

Patient (5) gave detail about their anxiety and depression demonstrating a failure of support mechanisms after discharge. Patient (5) states.

> *"Shortness of breath and that sort of thing. Yeah, and I just get other things, I can't even think at the moment. I get a lot of anxiety. I also have really bad depression, I'm on three Luvox at the moment. It's been useless, there's been no support during discharge. There's been no phone calls."*

The statement that there is no support during discharge is reinforced by a couple of the physicians interviewed in this study, staff (13) and (14)

Staff member (13) outlines:

> *"Because they (the COPD patient) need social support. Psychological support because this disease can lead towards levels of depression and anxiety".*

Staff member (14) says the lack of support as a causal factor for presentation outlining:

> *"They probably don't need to come in but because there isn't very good support for them or education for them that they end up being admitted when they probably don't need to."*

LACK OF KNOWLEDGE UTILISATION

Staff and/or patient knowledge (or lack thereof) was referred to in several instances as an influence to understanding COPD, cue recognition, continuity of care, and standard treatment. Examples included a lack of understanding around primary care or the palliative care requirements for COPD, the value of ED assessment information in ward care, continuity of care, and adherence to COPD evidence-based guidelines.

One of the ED physicians exclaimed that many people don't associate COPD with death:

> *"I always find it rather surprising that patients with, say, end-stage lung cancer, their family members acknowledge that their conditions have gotten worse, and death is an expected outcome, not so with COPD. I think it's a condition that people think they will just live with and die of something else, but very few people seem to believe that they will actually die because of COPD."*

One RN (Staff 3) mentioned the value that ED assessment can have for ongoing ward care:

> *"Some of their knowledge can be very insightful where they've picked up on things which may be missed on the ward. So, for example, carer stress would be one, which would sort of leave, it may have settled down by the time the person's come up to the ward, but it'd be quite obvious in ED."*

One of the ED Nurse Consultants (Staff 11) offered insight into continuity of care and the limitations of not having baseline knowledge:

> *"That's what should happen, whatever doctor or nurse or team who are looking after them will have to do their own assessment together and feel for the patient. But basically, if the patient is known to a particular service and team, you want to get them back to that service and team when they come in, because they're the best people that know of them. If someone who only sees them episodically is well how does this compare to your baseline? I don't know your baseline."*

An ED physician (Staff 4) outlined that most of the courses of action taken for a patient are done so without reference to the guidelines.

> *"Guidelines we don't refer to them often, they haven't changed for many years now, and it's usually standardised, you know, antibiotics if they've got a few infective type symptoms on them, otherwise its steroids and bronchodilators. That gets most people out of trouble, and a lot of patients are familiar with this regiment of treatment as well."*

DISCUSSION (INCLUDING LIMITATIONS)

This study confirms our findings from the scoping review by our COPD research team that future research should target ED avoidance with a stronger emphasis on coordinated community management preferably through nurse case management.9,20 COPD accounted for 12.2% of readmission within 90 days and 23.7% of readmission within 365 days from three major public hospitals in Tasmania.30 This study confirmed interventions to improve primary care access will reduce COPD related readmissions to ED.30 International evidence surrounding chronic disease presentations has revealed that moving from reactive management to proactive management demonstrated an increase in complex specialist nursing interventions and led to a decrease in emergency presentations and bed use at local hospitals.7,16 A systematic review conducted in 2016 confirms from several empirical studies that Nurse Case Managers can be effective in reducing ED usage for adults with chronic illnesses.18 The WHO has called for planned ongoing assessment, care and support coordinated by a practitioner case manager. WHO endorses a case manager following care over time to address both the physical and the mental health needs of people with complex multiple conditions or complicated circumstances.19 What this research was unable to confirm was the mix of resources within the participating health services that may already partially contribute to this type of role. COPD patient cases where nurses case managed and made monthly telephone calls and quarterly home visits to reinforce self-management education had an overall reduction in the number of urgent outpatient physician visits.31 Nurse case management have also proven to elicit prodromal symptoms in COPD patients which prevented acute exacerbations.32

Lari, Attaran, Tohidi,3 provided good evidence surrounding the need for regular communication of COPD Assessment. The authors recommend a COPD Assessment Test which is a simple and valid tool for evaluating patient symptoms on an ongoing basis. These authors believe these types of tools may improve patient–physician communication during routine clinical visits and would aid in assessing functional status and response to treatment.3 A broader problem though is embedding and encouraging compliance with the regular application of such tools and the sharing of information at an inter-professional level, as the success of good self-management is believed to be reliant on the accompanying ongoing communication with healthcare personnel.17 Dissler et.al., 2014 study summarised from 22 qualitative studies COPD patients require better understanding of condition on how to manage breathlessness, fatigue, frailty, anxiety, social isolation, and functional psychological status.33 Case management nurses are best positioned to work with carers along with patients to achieve optimal function and wellbeing as a team between patients, carers, primary healthcare professionals.34 Case managers also possess the ability to prompt primary care practitioners to

utilise local support system especially with multimorbid patients and educate using flowcharts, action plan, holistic consultation through nurse led clinics.35

A lack of compliance with COPD guidelines does appear to be a catalyst for increasing the likelihood of harm with patients.15 Effective discharge planning coupled with good simple messaging to patients about their self-management appears to be the main recommendation that can potentially prevent relapse. Improving medication compliance through sound education, with a particular emphasis on inhaler techniques has been promoted as a means to decrease acute exacerbations.17 Fourteen Australian studies identified through a systematic review reported on COPD guideline nonadherence. COPD guideline indicators identified to be nonadherent with COPD guidelines over- or under-prescription of corticosteroids and antibiotics, and a lack of discharging patients with a smoking cessation plan or pulmonary rehabilitation.[8,35] Case managers frequently have the opportunity to review the discharge medication list and instructions after the physicians have completed them. Case managers have the capacity to double check patient data for accuracy and could ensure that transfer of necessary patient information accompanies the patient and is forwarded at an inter-professional level.[18,19] What this scoping research was unable to ascertain was a complete picture of associated deficits in patient assessment or care as a cause of ED presentations. Due to the nature of patient conditions, recruitment to this study was difficult with many potentially willing patients unable to participate.

Johnston and colleagues point to a lack of knowledge regarding pulmonary rehabilitation, and that building referral knowledge for pulmonary rehabilitation programs is a crucial step in achieving implementation of guideline recommendations in the care of people with COPD.[15] Utilising the knowledge of a broader inter-professional healthcare team not only assists the client, but also adds to the healthcare team's knowledge by informing them of a patient's strengths and weakness in everyday quality of life scenarios, including exercise.[15] What is clear from one staff statement, *"Guidelines we don't refer to them often, they haven't changed for many years now, and it's usually standardised"*, is that there is likely to be elements of evidence-based guidelines that are not being adhered to.[4] What is known from research investigating barriers to evidence utilisation is that evidence utilisation in healthcare can be difficult thereby interfering with knowledge generation, acceptance, and ultimately utilisation of the correct evidence.[28] Results from this study confirms findings from staff qualitative interviews from interdisciplinary emergency department staff on barriers of guideline adherence.[36] Prominent barriers reported to be interfering with guideline adherence included lack of knowledge, lack of professional role clarity, need for clinical behaviour regulation, Interference with memory, attention, and decision process, beliefs about departmental capabilities, environmental context, and resources.[36] Nurse case managers will be able to provide reported potential interventions from this study which included patient education, training (inhaler technique), providing time-efficient digitalised referrals to primary healthcare.[36] Lack of psychological interventions input to promote wellbeing in this patient cohort to mitigate anxiety, distress may also be provided by nurse case manager.[37]

IMPLICATIONS FOR PRACTICE AND/OR POLICY AND RESEARCH

Results stemming from this research initiative are timely. In order to reduce avoidable COPD emergency presentations the promotion of early intervention initiatives is required, through innovative and targeted ED and hospital avoidance strategies that offer alternative and regular COPD assessment points, ongoing support and monitoring, and earlier detection of deterioration, e.g. Nurse Case Managers.[7,18,19] Findings stemming from patient and staff voices herein indicate that healthcare services need to invest in resources that offer consistent and long-term continuity of care and support for COPD patients in order to minimise unnecessary presentations to the ED. These voices call for research that can demonstrate how cost effective a Case Management role for patients with COPD can be when implemented to complement and enhance existing inter-professional care structures. Future research not only needs to consider the cost benefits of such roles, but also the long-term impact roles like these have on mitigating risks to patients, improving inter-professional communication of patient data and disease progression, and improve compliance with COPD evidence-based guidelines.[3,7,16,18]

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RESEARCH ARTICLES

Gravimetric assessment of postpartum blood loss: training and implementation in a low resource setting

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ABSTRACT

Objective: This study aimed to evaluate the training and implementation of the gravimetric method for estimating postpartum blood loss in clinical practice in Indonesian midwife-led birth centres.

Background: Postpartum haemorrhage remains a leading cause of maternal death, particularly in low-resource settings. There is no gold standard for assessing blood loss volume during labour and childbirth. Studies recommended using a gravimetric method to measure blood loss in low-resource settings due to its relative accuracy and simplicity.

Study design and methods: An online training module for the use of the gravimetric method was developed. All participants undertook the training and were asked to implement the method in clinical practice. A pre/post-test study design was used to examine midwives' understanding of the gravimetric method; their implementation experience was explored using a structured questionnaire. Knowledge was assessed pre-training. The training consisted of both theoretical and practical elements and the opportunity for participants to ask questions. Post-training tests were administered, followed by a one-month period of implementation and an evaluation of their experience of using the method in practice.

Results: Two hundred and eighty-five midwives from 17 health facilities were recruited to the study, and a total of 101 midwives from 12 health facilities completed all elements. The participants' understanding of the gravimetric method improved significantly following the training. Although a number of challenges were identified regarding the implementation of the gravimetric method in practice, the participants were generally positive about its use, and 89% said that they would recommend this method to colleagues.

Conclusion: A three-hour online training effectively improved participants' understanding of the gravimetric method for assessing blood loss volume. This study identified midwives' positive experiences with the gravimetric method and identified areas to improve practitioner experience of implementation in practice.

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Implications for research, policy, and practice: A three-hour online training followed by a one-month implementation period could be an effective and efficient approach to developing midwives' understanding and use of the gravimetric method of blood loss estimation postpartum.

What is already known about the topic?

- The gravimetric method estimates the blood loss volume by weighing sanitary materials used during the labour process (i.e., gauze, sheets, swabs, pads, etc.) before and after being contaminated by the blood.
- In clinical practice, the weight difference (in grams) is considered as 'blood loss volume' for ease of measurement and reported in millilitres without any formal conversion of units of weight to volume.
- The benefits of the gravimetric method have been reported previously. However, there is limited evidence on the evaluation of this method to train midwives regarding implementation of the gravimetric method in clinical practice.

What this paper adds

- An online training programme is effective in increasing midwives' knowledge and awareness of the gravimetric method for postpartum blood loss assessment.
- The midwives found the gravimetric method simple to adopt in clinical practice, which increased their confidence in detecting postpartum haemorrhage.
- The midwives encountered some barriers while implementing the gravimetric method and provided strategies to mitigate the issues raised.

Keywords: Gravimetric method; birth; blood loss assessment; online training; postpartum haemorrhage.

OBJECTIVE

This article reports the evaluation of an online gravimetric method (GM) training and implementation program for midwives in clinical practice in Indonesian midwife-led birth centres.

BACKGROUND

Postpartum haemorrhage (PPH) is defined as "a blood loss of 500 ml or more within 24 hours after birth[1(p.3)]" while severe PPH is "blood loss greater than or equal to 1000 ml within 24 hours.[2(p.1)]" Severe PPH is associated with one or more of the following conditions: blood transfusion, transcatheter arterial embolisation, arterial ligation, uterine surgery, hysterectomy, long-term psychological impact, or even maternal death.[3-5] As a life-threatening condition,[4] postpartum haemorrhage is estimated to account for 27% of maternal deaths worldwide[6] and 30% of maternal deaths in Indonesia.[7] In Indonesia, this percentage has remained stable from 2012 to 2019.[7,8]

Postpartum haemorrhage diagnosis relies in part on the accuracy of blood loss assessment.[9,10] A delay in PPH management may lead to poor outcomes which is often caused by a delayed diagnosis of PPH.[11] Rosmaria et al. found that 94% of Indonesian midwives involved in that study did not routinely assess blood loss volume.[10] Moreover, there is currently no recommended gold standard for assessing blood loss to help PPH diagnosis.[12,13] Blood loss can be measured using a number of methods, including colourimetric,[14] photometric,[15] semi-automatic,[16,17] mathematical formulas,[18] computer-based mathematical modelling,[19] and radioisotope dilution methods.[20] Nevertheless, most of them are complicated and impractical to apply in a real-life midwifery practice.[18] The most common method used to estimate blood loss by health professionals worldwide is a visual method due to its ease of use, and can be easily and quickly done at various levels of health facilities.[9,18,21] Despite the benefits of this method, it has been found to be inaccurate, in particular when there are higher levels of blood loss.[10,15,18,22] Therefore, Bose et al. (2006) and Schorn (2010) suggested replacing visual checks with a more accurate measure for assessing blood loss volume.[15,22] The gravimetric method (GM) has been recommended due to its accuracy and relative simplicity of use.[23,24] This method is an assessment carried out by weighing all maternity pads before and after being exposed to blood, followed by calculating the weight difference.[9,25,26] It is an evidence-based method of blood loss assessment, and evidence suggests that it may help in the diagnosis and management of PPH by providing a more accurate assessment of blood loss, therefore improving patient safety.[27] However, this method is not routinely used by Indonesian midwives.[10] No previous research was identified that explored the evaluation of training midwives in the GM and exploring barriers and facilitators to the implementation in practice. This study therefore aimed to evaluate an online GM training and implementation programme for midwives in clinical practice in Indonesia.

STUDY DESIGN AND METHODS

A pre/post-test design was used to measure midwives' knowledge before and after online GM training and evaluate implementation in practice in the first month following training. A midwives' experiences questionnaire (MEQ) was designed and used to study the barriers and facilitators to implementation.

Data were collected from December 2020 to March 2021. Technology-based learning using an online platform (Zoom Video Communications, Inc.) was adopted following Coronavirus disease (COVID-19) restrictions to avoid the risk of COVID-19 transmission associated with conventional face-to-face approach.

The midwives who participated in this study came from various clinical settings (i.e., primary health centres and independent midwifery clinics) and geographical locations (i.e., urban and rural areas). In order to familiarise participants with online learning technologies and address any potential technical issues that may arise during the actual training rollout, all participants were given the opportunity to test the online processes. We identified and rectified various technical issues encountered by the participants during this process. We proposed that the midwives attend the training from their workplaces rather than from home to avoid any internet connection issues and allow them to demonstrate the GM immediately following the training. Furthermore, we recommended an online backup strategy for individuals who attended the training from home (e.g., tethering internet from another mobile phone in case of poor connectivity, where possible).

GRAVIMETRIC ASSESSMENT OF BLOOD LOSS

The gravimetric method has been previously described in detail.[9,25] Briefly, it comprises the assessment of blood loss volume by weight. It is estimated by weighing maternity pads used during labour to calculate the increase in weight of maternity pads due to absorption of blood lost during labour. The total weight gain in grams is considered as 'blood loss volume' and reported in millilitres without any formal conversion of units of weight into volume for the ease of conversion, and to avoid complexities around inter- and intra-subject variability in blood density across women.

STUDY SETTINGS

The study was undertaken in maternity units at primary health centres (PHCs) and independent midwifery clinics (IMPs), located in the West Nusa Tenggara, West Java, and Riau provinces of Indonesia. In preparation for the training and implementation, all maternity units were equipped with a digital scale with a built-in tray (model PS2000 with a weighing capacity of 3000 g with an accuracy of ±0.1 g).

PARTICIPANT RECRUITMENT

All midwives who worked in the selected maternity units were invited to take part in the study. To be eligible to take part in the study, the participants should be qualified with a minimum of Diploma 3 in midwifery (i.e., the qualification required to practise midwifery in Indonesia) and showing willingness to participate in the study and implement the GM in their clinical practice.

MEASURES

The pre/post-tests were developed in three phases, (i) identification of components from the literature, (ii) item generation, and (iii) content validity. It was a 5-item multiple-choice knowledge test with scores of 1 for correct and 0 for incorrect answers. Test topics covered postpartum haemorrhage diagnosis, gravimetric method implementation, blood loss volume calculations, and starting and ending assessment times. Furthermore, the midwives' experiences questionnaire (MEQ) was adapted from Smith's customer satisfaction survey questions and adopted to fit the research context and content.[28] A reverse translation (i.e., translating English into Indonesian and then back into English) was performed on both questionnaires to ensure accuracy.

INTERVENTION

This training was held in collaboration with the Indonesian Midwives Association (IBI), Branch of Indragiri Hilir District. During the training course development, the researchers consulted extensively with the IBI (its Regional Executive Board for Riau Province and its Branch Executive Board for Indragiri Hilir District), the heads of health facilities, midwives' coordinators, and midwives' practitioners. The curriculum development also followed the guidelines and regulations for the training and development of healthcare professionals as a basis for its formulation. Furthermore, the training was registered and accredited by the Regional Executive Board of the IBI in Riau Province to ensure its credibility.

A three-hour training covered an overview of maternal mortality and PPH and the GM to measure blood loss, discussion, and demonstration. The training materials included PowerPoint slide notes, standard operating procedures of the GM, and video tutorials. Participants were asked to complete the pre-test and post-test via the link sent to Zoom's chat box before and after the training. Some participants with interrupted internet access completed the post-test using another phone's mobile data connection.

The participants were trained together. Some participants accessed the training from their workplace whereas some attended from home. During the training, the head of health facilities assigned some midwives who worked in antenatal and postpartum wards to take over maternity unit duties temporarily so that participants could focus on the training. At the end of the training, a representative midwife from each health facility was asked to practically demonstrate the GM by weighing the maternity pads and calculating the weight difference. The participants were then asked to implement the GM in their workplace for a month. The experience of implementing the GM was explored using the MEQ.

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STATISTICAL ANALYSIS

Data were analysed using a IBM Statistical Package for Social Sciences (SPSS) for Windows, version 19.0.[29] Participants' demographic details and experiences in applying the GM were analysed using descriptive statistics. The normality of the difference scores of interval data (n = 232) were assessed by Kolmogorov-Smirnova test, and Wilcoxon's matched pairs Signed Ranks test then compared the midwives' understanding of the GM before and after attending the training (for non-normally distributed outcomes and rank measures).

ETHICS AND TRAINING ACCREDITATION

Ethical approval was obtained from University of Huddersfield, United Kingdom (SREIC Ref: SREIC/2020/093) and the EHSC (Ethics of Health Study Committee, the Medicine Faculty of Universitas Padjadjaran, Indonesia, No. 1184/UN6.KEP/EC/2020). This training was also accredited and awarded 3 CPD points (Registration No. 104/PDIBI.RIAU/SKP/IX/2020) from the Regional Executive Board of the Indonesian Midwives Association (IBI) in Riau Province.

RESULTS

A total of 285 midwives from 17 health facilities (i.e., 13 primary health centres (PHCs) and four independent midwifery clinics (IMPs) were recruited to the study. Different numbers of midwives from each health facility participated, depending on how many worked in maternity units. Two hundred and thirty two of the 234 participants who attended the training completed a knowledge test before and after the training. Further, midwives from one PHC could not attend the training, and four other PHCs dropped out during the implementation period due to the COVID-19 pandemic. Finally, 101 participants from 12 health facilities completed the training, implemented the gravimetric methods in midwifery practice and completed the MEQ (Figure 1).

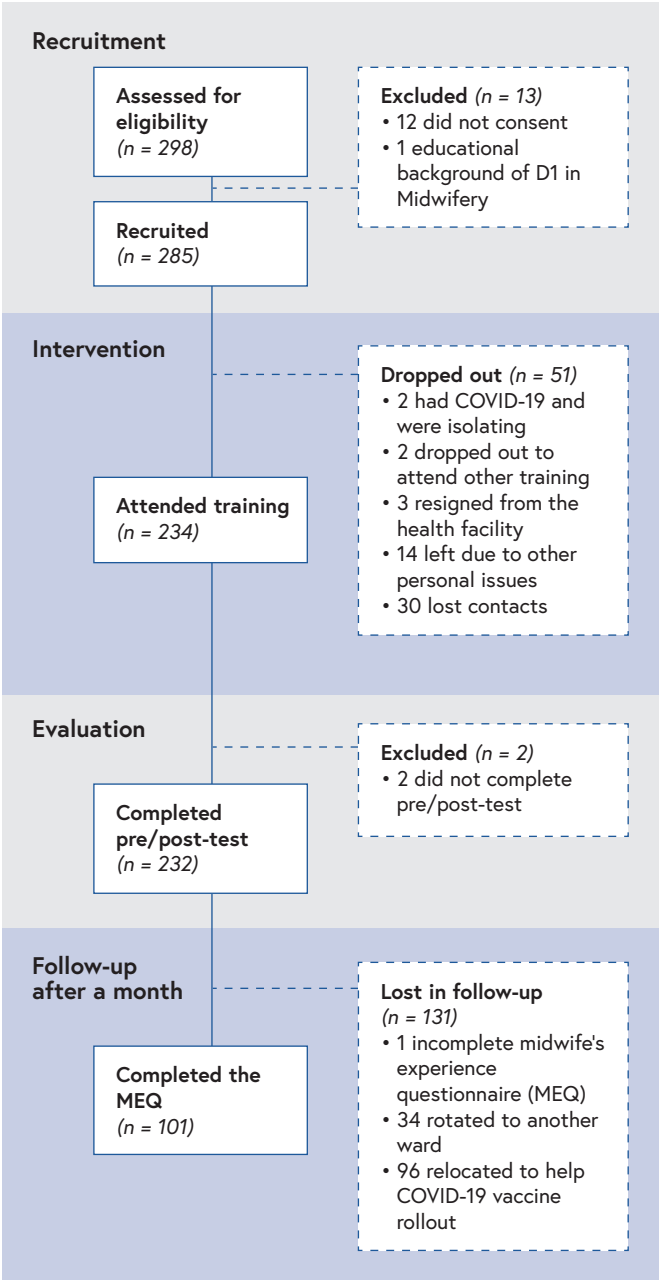

FIGURE 1: PARTICIPANT RECRUITMENT FLOWCHART

TRAINING ON GRAVIMETRIC METHOD

Pre/post-test

The mean age of participants at the recruitment was 31.87 (SD 7.75) years. Nearly 20% of participants had higher than Diploma 3 in midwifery and most had no prior knowledge of the GM (73.3%), as described in Table 1.

TABLE 1: PARTICIPANTS' CHARACTERISTICS (N = 232)

	n (%)
Age	
20-30 years old	120 (51.7)
31-40 years old	73 (31.5)
41-50 years old	31 (13.4)
+51 years old	8 (3.4)
Education	
Diploma 3 of Midwifery	185 (79.7)
Diploma 4 of Midwifery	44 (19.0)
Bachelor of Midwifery	1 (0.4)
Master of Midwifery	2 (0.9)
Having prior knowledge of the GM	
No	170 (73.3)
Yes	62 (26.7)
Source of prior knowledge	
Friends or relatives	14 (6.0)
Internet	16 (6.9)
Midwifery school	15 (6.5)
Midwifery training	9 (3.9)
Research articles	8 (3.4)

The distribution of the difference scores was not normal, as revealed by the Kolmogorov-Smirnov test results; therefore, the comparison between midwives' understanding of the GM before and after attending the training was analysed using Wilcoxon's matched pairs Signed Ranks test. The average score of participants' overall understanding of the GM significantly increased by 77% (3.73 to 4.50) ($Z=-8.2$, $p<0.001$) after joining the training.

Training experience

Interactive training via Zoom was offered on two occasions; those who missed the first session could attend the second one. During the training, participants also watched the GM video, followed by a practical demonstration of weighing pads by a representative midwife from the respective health facility. Before and after demonstration, participants were encouraged to ask questions. All training activities went according to the plan. However, some participants had interrupted access to the internet; consequently, the facilitator re-explained the missing information during question and answering sessions. Moreover, the video recorded training was also made available to affected participants. It also allowed them to watch the training at their own pace and convenience.

IMPLEMENTATION OF THE GRAVIMETRIC METHOD

All participants who successfully completed the training and implemented the gravimetric method (GM) in their workplace for one month were invited to complete the MEQ. All participants (n=101) who implemented the GM completed the MEQ. The experience of implementing the GM were analysed using content analysis.[30]

None of the participants had previous experience with the GM of measuring postpartum blood loss (Table 2). The COVID-19 pandemic significantly affected the number of women who gave birth in primary health facilities. Most women were referred to hospital due to COVID-19-related symptoms. This resulted in reduced opportunities for midwives to use the GM. As a result, most participants (89.1%) only performed the GM one to three times during the one-month implementation period. Overall, 86% of participants were generally satisfied with using the GM and, 90.3% felt that the GM was extremely or very helpful in diagnosing PPH. Almost 90% said that they would be between likely and extremely likely to recommend this method to colleagues. However, even though there was general satisfaction with implementing the GM, only 14% of participants stated that they had no difficulties implementing the GM, but these barriers were generally considered to be minor (Table 2).

The specific barriers were explored using an open-ended question. Responses were then categorised based on similar answers and counted for frequency. Many of the participants stated that the GM was beneficial in diagnosing PPH. A list of problems faced by midwives during implementation is summarised in Table 3. Over a third of participants who had only performed the GM once found it was not easy to implement, mainly due to their unfamiliarity with the technique. Further, half of the participants who worked alone while performing the GM felt it was time consuming as they were already busy in providing intrapartum care and weighing the maternity pad and calculating weight difference added to their workloads. The blood loss assessment was initially started from the second stage of labour or immediately after amniotomy procedures (if any), as Bell et al. (2020) suggested,[31] and ended two hours after placental delivery. However, after initial implementation and discussion the assessment was restricted to the postnatal period only (i.e., immediately following the birth of the baby) this improved the accuracy and ease of implementation.

We also provided space for open-ended text comments on the MEQ to identify further recommendations from the participants. Sixty participants made recommendations to improve midwives' experiences in using GM in their routine practice. The recommendations were analysed using content analysis.

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TABLE 2: MIDWIVES' EXPERIENCE IN IMPLEMENTING THE GRAVIMETRIC METHOD (N = 101)

Questions	n	%
1. Have you implemented the GM in assessing primary PP blood loss in practice?		
Yes	101	100
No	0	0.0
2. Previously, what is the method that you have been used to assess PP blood loss?		
None	72	71.3
Physiological parameters (blood pressure and pulse)	1	1.0
Visual method	21	20.8
Collecting blood into a kidney dish tray	5	5.0
Gravimetric method	0	0.0
Combination of visual method and physiological parameters	2	2.0
3. How many birth(s) assisted by you have used the gravimetric method?		
1-3 birth(s)	90	89.1
4-6 births	8	7.9
7-9 births	2	2.0
+10 births	1	1.0
4. Do you think this method helps you in diagnosing primary PPH?		
Extremely helpful	30	29.7
Very helpful	61	60.4
Somewhat helpful	9	8.9
Not so helpful	1	1.0
Not at all helpful	0	0.0
5. Based on your experiences, what are the benefits of the gravimetric method?		
Easy to be implemented		
Yes	72	71.3
No	29	28.7
Quick or less time-consuming		
Yes	49	48.5
No	52	51.5
Accurate		
Yes	52	51.5
No	49	48.5
6. Are you having problems implementing this method?[a]		
Not at all	14	13.9
A little (in the beginning)	41	40.6
A little	40	39.6
A medium amount	6	5.9
A great deal	0	0.0
7. Overall, how satisfied or dissatisfied are you with using this method in practice?		
Very satisfied	46	45.5
Somewhat satisfied	41	40.6
Neither satisfied nor dissatisfied	12	11.9
Somewhat dissatisfied	2	2.0
Very dissatisfied	0	0.0

8. How likely is it that you would recommend this method to your colleagues?

	Not at all likely										Extremely likely
Scale	0	1	2	3	4	5	6	7	8	9	10
f	0	0	0	0	2	7	2	23	31	22	14
%	0.0	0.0	0.0	0.0	2.0	6.9	2.0	22.8	30.7	21.8	13.9

[a] Further finding regarding the problems faced by the midwives can be seen in Table 3.

TABLE 3: CHALLENGES FACED BY MIDWIVES DURING THE GM'S IMPLEMENTATION (N = 87)

SHORTCOMINGSa	N	%
If blood mixed with urine or amniotic fluids, the result will be unreliable.	23	26.4
It took longer to weigh all the maternity pads because it was a new method.	34	39.1
It took longer to weigh because the size of the scale and the second tray was imbalance.	20	23.0
It took longer to calculate the weight difference.	4	4.6
The accuracy of the results depends on the accuracy of the scale and the procedures applied.	4	4.6
Sometimes forgot to weigh the maternity pads because it was a new method.	3	3.4
It needed more underpads or maternity pads	2	2.3
There was no time to weigh the maternity pads if the midwife was alone, there were many patients to look after, or in emergency case.	12	13.8
There was no time to weigh dry delivery pad if the pregnant woman came with a full cervix dilatation (10 cm)	5	5.7

[a] Some participants reported more than one problem.

The size and number of digital scales

The built-in tray's size from the scale was too small and did not fully contain the maternity pads; therefore, the default tray was replaced with a larger sized tray. Twenty-two participants perceived that the size of the digital scale and the additional tray provided caused difficulties as they felt it made it difficult to weigh and read the scale simultaneously. They further recommended a larger scale with a built-in tray.

> "*My suggestion is that the scales should be bigger with a built-in tray, so we could use it directly without adjusting the additional tray. The existing scale is too small, and the extra tray is too big, so it took time to adjust it.*" (P1)

Moreover, due to limited resources, we could only provide one digital scale to each health facility. One participant recommended that the number of digital scales available in the facility should be based on average number of patients visiting the health facilities. In an ideal world, if resources were not an issue in a particular health facility, a dedicated scale per labour bed would make it more convenient for the midwives.

> "*Please provide more scales because, sometimes, we have many patients to look after at the same time.*" (P20)

Broader training dissemination

Twenty-one participants felt that this method was objective and valuable to support PPH diagnosis and felt that it should be widely disseminated to other midwives across the country.

> "*This method is more accessible to implement than the visual method, so it is recommended to train more midwives (not only midwives in public health centres, independent midwifery practices, and midwives in hospitals in Indonesia but also in other countries).*" (P26)

Contamination by other fluids

There was concern about the accuracy of the measurement due to the contamination with other fluids (urine and amniotic fluid specifically)

> "*In some cases, patients urinated during labour. As a result, the blood was not only contaminated by amniotic fluid but also with urine. What is the solution for this case? Please provide a solution in this case so that we could assess blood loss accurately*". (P63)

Additional tool and assessment frequency

Participants had difficulties calculating the weight difference manually; therefore, they used a calculator on their smartphones to calculate the weight difference. Three participants felt that a smartphone application that could record the result in each stage and calculate the final weight difference.

> "*…, it would be great if there is a specific application (smartphone) to help us in recording and calculating the weight difference. Otherwise, it would be complicated and may lead to a miscalculation*". (P33)

Peer support

Four participants recommended supporting staff to assist the midwife to help weigh the maternity pad and calculating the weight difference to allow the midwife to focus on providing care.

> "*The application of this method was easy if a peer or student midwife could help us to do it. However, it was hard to look after [by] ourselves because we have to write the results immediately after weighing. Otherwise, we would miss it. It was not straightforward as we were wearing gloves, especially when there was a referral case (such as an emergency situation*)". (P60)

DISCUSSION

Postpartum haemorrhage is a preventable cause of death and yet women continue to die from it.[32] Prior research indicated that many Indonesian midwives did not routinely assess blood loss volume during labour.[10] Blood loss assessment (BLA) plays a crucial role in diagnosing PPH. Clinicians may be able to offer interventions in time if PPH was diagnosed promptly and accurately.[9,10] Delays in recognising PPH may result in inadequate treatment, a major cause of maternal mortality during labour.[33]

According to many studies, PPH is more likely to cause maternal death in rural areas than in urban areas.[34,35] One of the factors contributing to the delays in appropriately managing PPH in low-resource settings was the lack of equipment, supplies, and support.[36] The gravimetric method could help in the timely diagnosis of PPH, a key factor to ensure appropriate management. Lilley et al. (2015) suggested that, during a simulated exercise, the gravimetric method was found to be easy to teach and implement, required simple equipment, and could be applied at all levels of healthcare.[9]

The participants experienced difficulties in weighing and reading balances due to the smaller sized scale and the bigger sized additional tray. Replacement of the previous scale with a new larger scale with a proportionate built-in tray with a maximum capacity of 5000±1g resolved the issue. A further challenge for midwives was the limited availability of scales; due to limited resources, each health facility received only one digital scale. It was recommended that the average number of concurrent births and midwives per shift should be considered to determine the number of digital scales needed in each health facility.

Furthermore, using a calculator on a smartphone to calculate the difference in weight was impractical, especially when the midwives were wearing gloves contaminated with amniotic fluid and blood. This issue has been addressed by using a real large calculator placed near the digital scale or taped to the wall. The calculator could easily be used, cleaned, and disinfected after being used.

Further, some participants reported that urine or amniotic fluid contaminated blood during some deliveries, making the PPH assessment potentially unreliable. A similar finding was reported in previous studies.[31,37,38] For women who had episiotomies, gauze and swabs that were used to hold the wound and absorb the blood before the baby's birth had to be weighed in addition to the maternity pads.

The participants felt that the gravimetric method would prove helpful to most participants in diagnosing primary PPH. The results from Bell et al. (2020) also support this finding, high diagnostic rates of PPH were reported using this method.[31] GM has been applied in many clinical settings, including intraoperative,[23,39] and vaginal delivery.[25] Despite the benefits of GM, some midwives in busy clinics found it

increased their workload and posed a challenge in emergency obstetric cases. Therefore, they recommended additional supporting staff (e.g., a midwife peer or a student midwife) to help with the blood loss assessment in the labour ward.

The strengths of the study were that it was conducted in two different levels of health facilities across three provinces in Indonesia and included a month-long follow-up to capture the midwives' experience and reflections. The study, therefore, provided an accurate picture of the benefits and weaknesses of the implementation of the GM in midwifery clinical practice to help measure postpartum blood loss.

However, the study had a number of limitations. It was conducted in the backdrop of COVID-19 pandemic and significantly affected the training process and continuing participation. The online training module was implemented successfully and proved to be an effective alternative in settings like COVID-19 pandemic where a conventional face to face program was not possible. An increase of COVID-19 cases nationally led to the closure of several wards within health facilities in Indonesia during the study and consequently resulted in extensive ward rotations that resulted in study participant withdrawals. Most health workers were also relocated to help COVID-19 national vaccine rollout and hence withdrew from this study (Figure 1). The increase in workload amid the pandemic also created additional pressures and limited opportunity to apply the GM in everyday practice. Shoja et al. also reported that the COVID-19 pandemic increased the health professionals' workload and put more stressors, physical and time pressures, and frustration.[40] Nonetheless, the online methodology and use of technology provided an opportunity to continue research in this challenging context and this method of training was well suited. It also offered the flexibility to complete the recorded material at their own pace and convenience in contrast to the conventional approach where there may have been an expectation to attend full training in-person, demanding greater resources.

Moreover, currently, there is no validated questionnaire to assess midwives' experience in implementing the GM. Hence, we developed the MEQ by referring to the customer satisfaction survey questions proposed by Smith.[28]

CONCLUSION

We conclude that a three-hour training effectively improved midwives' understanding of the GM. Following one month implementation, midwives felt competent in assessing the BLV using GM during labour. The study also identified useful adaptations to improve the GM implementation in routine practice.

Stakeholders need to consider equipping maternity units with adequate equipment and human resource to support the implementation of the GM (e.g., calculators and digital scales with adequate specifications and amounts, and midwife buddies). A midwives' peer group is beneficial not only for applying GM but also for easing midwives' workload when handling emergency situations.

Participants believed GM may result in early detection of the PPH and therefore enable health professionals to manage PPH more effectively. We, therefore, recommend policy makers adopt GM procedures as part of normal intrapartum care in low-resource settings. The long-term impact of GM on reducing postpartum haemorrhage still remains to be evaluated in future studies.

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RESEARCH ARTICLES

Psychosocial impact of the COVID-19 pandemic on Australian nurses and midwives: a cross-sectional study

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ABSTRACT

Objective: To investigate the psychosocial effects of the COVID-19 pandemic on nurses and midwives working in acute care settings, specifically psychological distress, self-reported concerns, and perceived impact on their work and personal lives.

Background: Little is known about the psychosocial impact of the pandemic on nurses and midwives in Australia, a country with a substantially lower number of COVID-19 cases and deaths than many others. Few studies investigating the prevalence of psychological distress among nurses during the pandemic have been conducted in more than one setting, especially in the Australian context.

Study design and methods: Cross-sectional survey design (STROBE checklist). Nurses and midwives (n=1,611) at four metropolitan tertiary health services in Melbourne, Australia completed an anonymous online survey between 15 May and 31 August 2020, which assessed symptoms of depression, anxiety and stress (DASS-21); concerns related to COVID-19; and other effects of COVID-19. Space was provided for free-text comments.

Results: Approximately one fifth of respondents reported moderate to extremely severe symptoms of depression, anxiety and stress. Fewer years of clinical experience were significantly associated with higher levels of psychological distress. More than half of the respondents were extremely/very concerned about passing COVID-19 on to family members and about their family's health, and almost half were concerned about caring for a patient who had confirmed or suspected COVID-19. Respondents reported that certain precautionary measures such as personal protective equipment (PPE) interfered with their ability to provide optimal patient care. Positive aspects of the pandemic were also reported including a sense of togetherness and cooperation among staff.

Conclusion: The COVID-19 pandemic has had a considerable impact on the psychological wellbeing and work and personal lives of nurses and midwives working in acute care settings in Melbourne, Australia, particularly those with less clinical experience.

Implications for nursing and health services research, policy and practice: Nurses and midwives, particularly those with less clinical experience, would benefit from additional, targeted wellbeing and support initiatives. For those with less experience, initiatives could include being partnered with more experienced colleagues and educators who can provide practical and emotional support and monitor their stress levels.

What is already known about the topic?

- Nurses and midwives have experienced more psychological distress than other healthcare workers during the COVID-19 pandemic.
- Most studies about the psychosocial impact of the COVID-19 pandemic on nurses and midwives have been conducted in a single health service.
- Few studies have concurrently investigated the experiences of nurses and midwives from different health services during the COVID-19 pandemic especially in the Australian context.

What this paper adds

- Despite the relatively low number of COVID-19 cases and deaths in Australia, the COVID-19 pandemic has had a considerable impact on the psychological wellbeing and work and personal lives of Australian nurses and midwives.
- About one in five of the nurses and midwives surveyed reported moderate to extremely severe symptoms of depression, anxiety and stress during the first wave of the pandemic.
- Nurses and midwives with fewer years of clinical experience experienced higher levels of psychological distress than those with more experience.

Keywords: Australia; COVID-19; hospitals; nurses; midwives; mental health

OBJECTIVE

At the time the study was conducted (May-August 2020), most of the published peer-reviewed evidence about the impact of the COVID-19 pandemic on nurses and midwives was from countries with high numbers of COVID-19 cases and deaths, such as China,[1,2] and the United Kingdom (UK).[3] Australia has recorded relatively low numbers of COVID-19 cases and deaths in comparison to other countries.[4] Although evidence is starting to emerge about the impact of the COVID-19 pandemic on Australian nurses' and midwives' psychological wellbeing and their work and personal lives, most studies have been conducted in a single setting,[5] or have included nurses and midwives as part of a broader investigation of healthcare workers in general.[6,7] Recent reviews about the prevalence of psychological distress among nurses during the COVID-19 pandemic have identified few studies that have been conducted in more than one setting and none of these were from Australia.[8,9]

Understanding the impacts of the COVID-19 pandemic on nurses and midwives is important in planning appropriate support services, ensuring nurses and midwives can provide high quality patient care, and optimising their psychological wellbeing.[10] The aim of this study was to investigate the psychosocial effects of the COVID-19 pandemic on nurses and midwives working in Melbourne, Australia, specifically psychological distress, self-reported concerns, and perceived impact on their work and personal lives.

BACKGROUND

The COVID-19 pandemic led to unprecedented and rapid changes to healthcare delivery, and evidence is emerging about the immediate impact of the pandemic on healthcare workers such as nurses and midwives. Symptoms of anxiety,[1,11-15] depression,[1,11-15] and pandemic-related stress or distress,[1,11] as well as fear,[14] nervousness, fatigue, frequent crying, and suicidal thoughts[2] have been reported. Nurses and midwives appear to have experienced more psychological distress than other healthcare workers during the COVID-19 pandemic.[1,10,16]

Little is known about the impact of the COVID-19 pandemic on the personal and work lives of nurses and midwives. During previous outbreaks of infectious diseases such as Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome Coronavirus (MERS-CoV) and H1N1 influenza, healthcare workers reported concerns about their own and family members' health.[17-21] A recent Australian study conducted during the COVID-19 pandemic found that most of the hospital clinical staff surveyed were also concerned about their own health and infecting their families, friends and colleagues.[22] Further research is required to identify other concerns nurses and midwives may have experienced during the pandemic or are specific to COVID-19 as well as the effects of the pandemic on their personal and work lives and psychological wellbeing.

The aim of this study was to investigate the immediate psychosocial effects of the COVID-19 pandemic on nurses and midwives working in acute care settings in Melbourne, Australia. The specific objectives of the study were to assess: 1) nurses' and midwives' levels of depression, anxiety and stress; 2) the proportion of nurses and midwives in the mild, moderate, severe and extremely severe diagnostic categories for depression, anxiety and stress; 3) factors significantly associated with higher levels of depression, anxiety and stress; 4) nurses' and midwives' self-reported concerns about COVID-19; and 5) the impact of the pandemic on their work and personal lives.

STUDY DESIGN AND METHODS

DESIGN, SETTING AND PARTICIPANTS

A cross-sectional survey design was used; nurses and midwives employed at the study health services during the recruitment period (May–August 2020) were invited to complete a self-administered anonymous online survey.

The Australian health system includes both public and private providers. Public hospitals provide free or low-cost care and are funded by the government. Services in private hospitals are paid for directly by patients or their health insurer.[23] Nurses and midwives were recruited from four major metropolitan health services in Melbourne, the capital city of the State of Victoria, Australia; three are public health services which provide acute tertiary services, subacute care, specialist clinics and community health services. The other is a private not-for-profit health service which provides acute medical, surgical and rehabilitation services. The health services are located in different metropolitan regions of Melbourne (i.e. eastern, western, southern and inner-city) and the public health services provide care for more than half of Melbourne's population.

At the time of the study, the State of Victoria was in 'Stage 3' restrictions which included limits on indoor and outdoor gatherings (up to five visitors in the home, groups of up to 10 people outdoors),[24] physical distancing, remote learning for school-aged children, and working from home for non-essential workers. As of 15 May 2020, there had been 1,543 cases of COVID-19 in Victoria (most in metropolitan Melbourne) and 18 deaths; nine people were in hospital, including seven patients in intensive care.[25] During data collection, all of the participating health services were affected by COVID-19 clusters in their regions, and provided care for patients with COVID-19.

Approximately 22,740 nurses and midwives are employed at the four health services. To obtain a statistical confidence level of 95% with 5% margin of error, a sample size of 378 was required.[26]

The research adhered to the STROBE guidelines for cross-sectional studies.

PROCEDURE

The survey was available in Qualtrics (Provo, UT, USA), an online survey platform, for approximately four weeks at each health service during May to August 2020. The same survey was used at each health services and the data was collected concurrently. An invitation including the link to the survey was sent to the group email address for nursing/midwifery staff at each health service, followed by a reminder email 2–3 weeks later.

The survey was informed by similar published studies on the psychosocial effect of infectious disease outbreaks (e.g. SARS, MERS-CoV) on healthcare workers,[17,19-21,27,28] and the research team's clinical experience. Respondents' psychological wellbeing was assessed using the DASS-21, a widely used validated psychometric instrument.[29]

The survey included mostly fixed-response questions and assessed:

1. Sociodemographic and employment characteristics: sex, age, country of birth, professional role (e.g. nurse, midwife), living with school-aged children (yes/no), employment status (full time/part time/casual), years of clinical experience and years employed at health service.
2. Psychological wellbeing: Depression, anxiety and stress symptoms during the past week were assessed using the DASS-21.[29] In this study, Cronbach's α was 0.894, 0.777 and 0.899 for the Depression, Anxiety and Stress subscales.
3. COVID-19 concerns: six items about concerns related to the effects of COVID-19 on personal and family health, rated using a 5-point Likert scale ranging from 'not concerned' to 'extremely concerned' (the items are listed in Table 6).
4. Impact of COVID-19 infection control measures: nine items assessing the impact of COVID-19 precautionary measures, were rated using a 3-point Likert scale ranging from 'does not affect my ability to do my job' to 'affects my ability to do my job a lot' (the items are listed in Table 6).
5. Personal and work impacts of COVID-19: 15 items on work impacts and 11 items on personal impacts of COVID-19 were rated on a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree' (the items are listed in Table 6).

Space was also provided at the end of the survey for respondents to make free-text comments in response to the question 'Have we missed anything? If you have anything else you would like to tell us about the impact of COVID-19 on you or your role at [name of health service] please write it in the box below'.

DATA MANAGEMENT AND ANALYSIS

Data were analysed using IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarise the data.

DASS-21 subscale scores and the proportion of respondents scoring in clinical ranges were calculated as outlined by the instrument's authors,[29] subscale scores were not generated if responses to more than one item in the relevant subscale were missing. Using one-sample t-tests, the findings were compared with DASS-21 scores reported for adults in the general population and healthcare workers in other studies both prior to and during the COVDI-19 pandemic.

Associations between DASS-21 subscale scores and sociodemographic variables were examined using Mann–Whitney U-tests, Kruskal–Wallis tests or Spearman's *r* coefficients.

Variables significantly associated with DASS-21 subscales scores ($p<0.05$) in the univariate analyses were included in multiple regression models with the DASS-21 Depression, Anxiety and Stress subscale scores as outcome variables.

Responses to questions about respondents' concerns, interference of infection control measures and impact of COVID-19 on respondents' work and personal lives were summarised using frequencies and percentages.

Free-text comments were analysed using content (conceptual) analysis in order to identify the presence and meaning of certain themes or concepts.[30] The findings have been used to complement the quantitative data and illustrative quotes provided.

ETHICS APPROVAL

Completion of the survey was taken to indicate consent. The study was approved by the human research ethics committees (HRECs) of the participating health services: Eastern Health HREC LR20/035, 5 May 2020; Epworth Healthcare HREC EH2020-558, 5 May 2020; Monash Health HREC RES-20-0000-297A, 29 May 2020; and the Western Health Low Risk Ethics Panel HREC/20/WH/62913, 5 May 2020.

RESULTS

SAMPLE AND RESPONSE

Of the approximately 22,740 nurses and midwives employed by the four participating health services, 1,611 completed the survey, giving an overall response rate of 7.1% (range 1.2% - 13.0% response at each health service).

Most respondents were registered nurses (RN), female, born in Australia and employed on a part-time basis; approximately one-third lived with school-aged children. On average the respondents were about 40 years of age; had 15 years of clinical experience; and had been employed at their health service for almost nine years. The proportion of female respondents and those in each professional role (e.g. RN, midwife) was similar to those among all registered nurses and midwives in Victoria[31] (Table 1). A total of 1,000 free-text comments were provided by the respondents.

TABLE 1: RESPONDENTS' SOCIODEMOGRAPHIC CHARACTERISTICS

Characteristic	Sample nurses/midwives (n=1611)	Victorian registered nurses/midwives (n=121,167)[31]
Female	1470 (93%)	89.2%
Age (years), Range (Mean)	21-70 (39.9)	
Born in Australia	1002 (63%)	
Live with school aged children	495 (31%)	
Work full-time	433 (27%)	
Years practised, Range (Mean)	0-51 (15.4)	
Years employed at health service, Range (Mean)	0-47 (8.6)	
Professional role		
Registered nurse	1190 (75.0%)	70.2%
Enrolled nurse	97 (6.1%)	18.7%
Nurse practitioner	13 (0.8%)	0.4%
Nurse and midwife	119 (7.5%)	6.6%
Midwife	89 (5.6%)	1.3%
Other	77 (4.9%)	

PSYCHOLOGICAL WELLBEING

Overall, approximately one in five nurses and midwives surveyed reported moderate to extremely severe symptoms of depression (n=324, 20.8%), anxiety (n=311, 20.0%) and stress (n=292, 18.7%). There were no significant differences between nurses and midwives in the proportion reporting moderate to extremely severe symptoms of depression, anxiety or stress (Table 2) or their mean scores on the DASS-21 subscales (Table 3).

TABLE 2: PROPORTION OF NURSES AND MIDWIVES SCORING IN THE NORMAL AND CLINICAL RANGES OF THE DASS-21 SUBSCALES

Score ranges for clinical cut-off points[29]	n (%) scoring in each range		
	Nurses	Midwives	Total sample
Depression	*n=1358*	*n=203*	*n=1562*
Normal (0-4)	950 (70.0)	140 (69.0)	1,091 (69.8)
Mild (5-6)	130 (9.6)	17 (8.4)	147 (9.4)
Moderate (7-10)	174 (12.8)	30 (14.8)	204 (13.1)
Severe (11-13)	44 (3.2)	8 (3.9)	52 (3.3)
Extremely severe (≥14)	60 (4.4)	8 (3.9)	68 (4.4)
Anxiety	*n=1355*	*n=203*	*n=1560*
Normal (0-3)	911 (67.2%)	127 (62.6)	1040 (66.7)
Mild (4-5)	175 (12.9%)	34 (16.7)	209 (13.4)
Moderate (6-7)	124 (9.2%)	13 (6.4)	137 (8.8)
Severe (8-9)	69 (5.1%)	12 (5.9)	81 (5.2)
Extremely severe (≥10)	76 (5.6%)	17 (8.4)	93 (6.0)
Stress	*n=1358*	*n=202*	*n=1561*
Normal (0-3)	962 (70.8)	140 (69.3)	1,103 (70.7)
Mild (4-5)	145 (10.7)	21 (10.4)	166 (10.6)
Moderate (6-7)	116 (8.5)	20 (9.9)	136 (8.7)
Severe (8-9)	98 (7.2)	18 (8.9)	116 (7.4)
Extremely severe (≥10)	37 (2.7)	3 (1.5)	40 (2.6)

[a] Total N's are different to the N for the total sample (n=1,611) and nurse (n=1,378) and midwife (n=208) subsamples due to missing data.

TABLE 3: RESPONDENTS' SCORES ON THE DASS-21 SUBSCALES

DASS-21 Subscale	Nurses	Midwives	Total sample	p value
Depression	*n=1358*	*n=203*	*n=1562*	
Mean (SD)	3.71 (4.12)	3.82 (4.31)	3.72 (4.15)	p=0.812
Minimum	0.0	0.0	0.0	
Maximum	21.0	21.0	21.0	
Anxiety	*n=1355*	*n=203*	*n=1560*	
Mean (SD)	3.11 (3.24)	3.41 (3.68)	3.14 (3.30)	p=0.535
Minimum	0.0	0.0	0.0	
Maximum	18.0	19.0	19.0	
Stress	*n=1358*	*n=202*	*n=1561*	
Mean (SD)	5.72 (4.56)	5.89 (4.58)	5.75 (4.58)	p=0.587
Minimum	0.0	0.0	0.0	
Maximum	21.0	21.0	21.0	

The sample's mean score on the Depression, Anxiety and Stress subscales of the DASS-21 was significantly higher than normative data for the Australian general population[32] before the COVID-19 pandemic (p<0.001 for all); reported data for Australian nurses[33] prior to COVID-19 (p<0.001 for all); and healthcare workers in Singapore[34,35] during the COVID-19 pandemic (p<0.001 for all); but significantly lower than Portuguese nurses[36] during COVID-19 (p=0.008 Depression; p<0.001 Anxiety and Stress) (Table 4).

Sex, country of birth, having school-aged children living at home, employment status, age, years of clinical experience and years employed at the health service were all significantly associated with at least one DASS-21 subscale score and were therefore included in the regression models. Years of experience was highly correlated with age (r=0.869, p<0.001) and years employed at the health service (r=0.706, p<0.001), thus only years of experience was included.

In multiple regression models, fewer years of clinical experience and being born in Australia were significantly associated with higher DASS-21 Depression, Anxiety and Stress scores (p<0.001 for all three subscales). Not having school-aged children living at home was also significantly associated with higher DASS-21 Depression (p<0.001), Anxiety (p<0.001) and Stress (p=0.006) scores. Being male was significantly associated with higher DASS-21 Anxiety (p=0.027) and Stress scores (p=0.007) (Table 5).

SELF-REPORTED CONCERNS ABOUT COVID-19

More than half of the respondents were extremely or very concerned about passing COVID-19 on to family members and about their family's health, and almost half were extremely/very concerned about caring for a patient who had confirmed or suspected COVID-19 (Table 6).

> *"My mum is in aged care and I worry about her catching COVID."*

TABLE 4: SEVERITY OF MENTAL HEALTH SYMPTOMS

DASS-21 Scale	Study sample *(Australian nurses and midwives during COVID-19)* (mean, SD)	Australian general population *(before COVID-19)*[a] (mean)	Australian nurses *(before COVID-19)*[b] (mean)	Singaporean doctors and nurses *(during COVID-19)*[c] (mean, SD)	Critical care health workers *(various countries, mainly Australia; during COVID-19)*[d] (mean, SD)	Portuguese nurses *(during COVID-19)*[e] (mean, SD)	Australian general population *(adults, no mental health diagnosis, during COVID-19)*[f] (mean, SD)
Depression	3.72 (4.15) (n = 1,562)	2.57; p<0.001	2.88; p<0.001	2.54 (5.23); p<0.001	3.9 (4.15); p=0.090	4.0 (3.8); p=0.008	3.82 (3.49); p=0.349
Anxiety	3.14 (3.30) (n = 1,560)	1.74; p<0.001	2.17: p<0.001	2.45 (4.28); p<0.001	3.4 (3.75); p=0.002	4.2 (4.0); p<0.001	2.08 (2.56); p<0.001
Stress	5.75 (4.58) (n = 1,561)	3.99; p<0.001	4.80; p<0.001	3.82 (5.74); p<0.001	7.0 (4.8); p<0.001	7.3 (4.5); p<0.001	5.25 (3.75); p<0.001

[a] Crawford et al.[32] Hegney et al.[33]; N=132 [c] Tan et al.[34]; N=296 [d] Hammond et al.[7]; N=3,770 (nurses, n=2,269) [e] Sampaio et al.[36]; N=767 [f] Rossell et al.[48]; N=5,158

TABLE 5: SOCIODEMOGRAPHIC CHARACTERISTICS ASSOCIATED WITH DASS-21 SUBSCALE SCORES (MULTIPLE REGRESSION MODELS)

Independent variables	Depression		Anxiety		Stress	
	Standardised coefficients Beta	Sig	Standardised coefficients Beta	Sig	Standardised coefficients Beta	Sig
Sex (female)	–.037	p=0.140	–.054	p=0.027	–.067	p=0.007
Country of birth (born in Australia)	.095	p<0.001	.079	p=0.001	.097	p<0.001
School-aged children (live with)	–.096	p<0.001	–.088	p<0.001	–.068	p=0.006
Employment status (work full-time)	.007	p=0.793	–.022	p=0.374	.019	p=.447
Years of experience	–.202	p<0.001	–.294	p<0.001	–.228	p<0.001

TABLE 6: RESPONDENTS' PSYCHOSOCIAL CONCERNS ABOUT AND IMPACT OF COVID-19 ON WORK AND PERSONAL LIVES

Respondents' psychosocial concerns about COVID-19 (n (%) extremely/very concerned)	**n (%)**
Passing COVID-19 on to family members (n=1,545)	930 (60.2%)
Your family's health	869 (59.4%)
Caring for a patient who has or has suspected COVID-19 (n=1,543)	672 (43.6%)
Your colleagues having COVID-19 (n=1,544)	605 (39.2%)
Hospital patients having COVID-19 (n=1,543)	565 (36.6%)
Falling ill as a result of COVID-19 (n=1,545)	473 (30.6%)
Interference of infection control measures with work (n (%) affects ability to do job a lot/a little)	**n (%)**
Social distancing from colleagues (n=1,508)	1,010 (67.0%)
Staying away from work when you have any signs of illness (n=1,283)	837 (65.2%)
Restricted face-to-face meetings or gatherings (n=1,476)	930 (63.0%)
Mask (n=1,470)	846 (57.6%)
Goggles/eye shields (n=1,364)	620 (45.5%)
Imposed self-isolation on return from overseas trip (n=627)	224 (35.7%)
Face shields (n=916)	611 (33.3%)
Restricted access to some or all hospital sites (n=1,384)	433 (31.3%)
More frequent handwashing or sanitising (n=1,514)	252 (16.6%)
Gloves (n=1,436)	200 (13.9%)
Impact of COVID-19 on respondents' work lives (n (%) strongly agree/agree)	**n (%)**
It has been a learning experience (n=1,512)	1,370 (90.6%)
My job puts me at risk of getting COVID-19 (n=1,537)	1,269 (82.6%)
My awareness and knowledge of disease control has increased (n=1,524)	1,178 (77.3%)
I feel more stress at work (n=1,538)	1,079 (70.2%)
I have had to do work tasks that I don't usually do (n=1,519)	851 (56.0%)
There is an increased sense of togetherness and cooperation among the staff (n=1,525)	849 (55.7%)
I have had to do more work than I usually do (n=1,527)	797 (52.2%)

Respondents' psychosocial concerns about COVID-19 n (%) extremely/very concerned)	**n (%)**
I have had to cancel or postpone my annual leave because of the COVID-19 outbreak (n=1,382)	596 (43.1%)
I am disappointed that I have had to cancel or postpone my annual leave due to COVID-19 (n=1,260)	541 (42.9%)
I have had to retrain or do training courses so I can do a role/job I normally wouldn't (n=1,465)	485 (33.1%)
There is more conflict amongst colleagues at work (n=1,514)	420 (27.7%)
I don't feel very prepared to care for patients with COVID-19 (n=1,509)	402 (26.6%)
The situation has brought me closer to my manager (n=1,512)	358 (23.7%)
I have been less busy than usual (n=1,528)	255 (16.7%)
I have considered resigning because of COVID-19	248 (16.2%)
Impact of COVID-19 on respondents' personal lives (n (%) strongly agree/agree)	n (%)
I have avoided public or crowded spaces (e.g. shops, restaurants, public transport) (n=1,492)	1,314 (88.1%)
I have avoided interacting with my friends and extended family (n=1,421)	1,175 (82.7%)
My personal or family's lifestyle has been affected (n=1,517)	1,226 (80.8%)
People close to me have been concerned about my health (n=1,457)	1,086 (74.5%)
I have a greater appreciation of life and work (n=1,526)	927 (60.7%)
People treat me and my family differently because I work at a hospital (n=1,531)	711 (46.4%)
The COVID-19 situation has brought me closer to my family (n=1,536)	705 (45.9%)
My family and friends are worried they might get infected from me (n=1,423)	639 (44.9%)
People avoid me and my family because I work at a hospital (n=1,512)	536 (35.4%)
I am likely to suffer financial losses (n=1,520)	345 (22.7%)
I avoid telling people that I work at a hospital (n=1,532)	423 (27.6%)

THE USE AND EFFECTS OF COVID-19 PRECAUTIONARY MEASURES

Respondents reported that certain COVID-19 precautionary measures such as personal protective equipment (PPE) interfered with their ability to do their job. About two-thirds indicated that social distancing from colleagues, staying away from work due to illness symptoms, and restricted face-to-face meetings or gatherings had impacted their ability to do their duties (Table 6).

> *"I find it tiring to wear COVID PPE all day long. I hate it but I get the reason."*

WORK IMPACTS OF COVID-19

Most respondents were concerned that their job put them at risk of being infected with COVID-19, and agreed that they felt more stress at work due to the pandemic and that they have had to do work tasks that they would not normally do (Table 6).

> *"I feel anxious and stressed a lot of the time about the future and [this] has affected my sleep. I feel rundown a lot of the time and so cannot go into work ... I am scared I will have the virus and spread it to my colleagues and the vulnerable [people] that I care for."*

"I was seconded into a temporary role at the commencement of the COVID action plan and it was quite stressful."

However, the majority of respondents also reported positive impacts of the pandemic including that it had been a learning experience, their awareness and knowledge of disease control had improved, and there was an increased sense of togetherness and cooperation among staff (Table 6).

"[Ward name] has been an awesome team to be working with at this time. Feeling very grateful."

"I believe we have had a strong response to the challenges at [name of health service]. It has been an overall positive experience."

PERSONAL IMPACTS OF COVID-19

The majority of respondents agreed that they had avoided public or crowded spaces and interacting with their friends and family due to COVID-19; and that their personal or family's lifestyle had been affected by the pandemic (Table 6).

"Rostering and changes from COVID regarding family responsibilities such as home schooling, partners business and financial stability changed suddenly and made it very stressful…"

DISCUSSION

The COVID-19 pandemic has had a considerable impact on the psychological wellbeing, and personal and work lives of nurses and midwives working in acute care settings in Melbourne, Australia. One in five of the nurses or midwives surveyed reported moderate to extremely severe symptoms of depression, anxiety and stress. The nurses and midwives in this study also had significantly higher levels of depression, anxiety and stress than norms and reported data for the general Australian population and nurses before the COVID-19 pandemic as well as doctors and nurses in Singapore during the pandemic. Less experienced nurses and midwives also reported significantly higher levels of depression, anxiety and stress than their colleagues with more years of clinical experience. There were no significant differences between nurses and midwives in terms of their psychological wellbeing. Nurses and midwives were particularly concerned for their own and their family's health, and caring for patients with COVID-19.

PSYCHOLOGICAL WELLBEING

The findings of this study are consistent with those of others which have also found that healthcare workers especially nurses have experienced symptoms of depression, anxiety and stress during the COVID-19 pandemic.[1,10,35] However, comparison of the mean DASS-21 subscale scores of the Australian nurses and midwives in this study with those reported in studies conducted in other countries suggests that country specific factors such as the number of COVID-19 cases and deaths, and experience with previous coronavirus pandemics may be associated with healthcare workers' psychological wellbeing. Portuguese nurses experienced significantly higher levels of depression, anxiety and stress during the COVID-19 pandemic compared to Australian nurses and midwives in this study.[36] Similar to many European countries, Portugal had a considerably higher number of COVID-19 cases and deaths than Australia.[4] It is likely that this contributed to the relatively poor psychological wellbeing of Portuguese nurses as the Portuguese nurses were more likely to be caring for infected patients and/or have cared for patients who had died from COVID-19. In contrast, the nurses and midwives in this Australian study had significantly higher levels of depression, anxiety and stress than those reported for nurses and doctors in Singapore.[34,35] Although Australia had recorded considerably fewer confirmed COVID-19 cases since the beginning of the pandemic than Singapore at the time of this study (August 2020; 17,895 vs 52,512),[37] Singapore had also experienced a high number of cases and deaths during the 2003 SARS pandemic and as a result, strengthened its pandemic management capabilities making it better able to reduce the number of infections and minimise the impact of COVID-19 on its healthcare system and workers.[38]

Both nurses and midwives are at high risk for work-related depression, anxiety and stress[39] yet few studies have compared their wellbeing. At the time this study was conducted, little was known about the impact of the COVID-19 pandemic on the wellbeing of midwives particularly in Australia; most research had focused on 'frontline' nurses and doctors. This study found no significant difference in the wellbeing of nurses and midwives. In contrast, a study conducted in the UK found that midwives had slightly lower wellbeing scores than nurses (though it is not reported if the difference was statistically significant)[40] which may reflect the different measures used to assess wellbeing between these studies. However, it may be that although midwives experienced stress and anxiety during the pandemic due to challenges providing woman-centred care[41], like nurses they also experienced 'silver linings' or positive aspects including collaborative relationships and the development of new skills and knowledge[41] resulting in similar levels of depression, anxiety and stress.

Nurses and midwives with fewer years of clinical experience also reported higher levels of depression, anxiety and stress than those with more years of experience. Similarly, a recent study of UK nurses' experiences of working during the COVID-19 pandemic found that nurses with less experience had higher levels of anxiety and depression and lower resilience.[42] It may be that more experienced nurses and midwives have higher levels of clinical confidence and expertise and accordingly, feel more prepared to deal with the challenges of providing patient care during a pandemic

or other adverse events due to their knowledge and prior experiences,[42,43] and this has a protective effect on their wellbeing. It has also been suggested that graduate nurses experience transition shock or emotional distress when they commence their first professional role.[44] This may have contributed to the poorer psychological wellbeing reported by the nurses and midwives in this study who had fewer years of clinical experience.

CONCERNS AND IMPACT OF COVID-19 ON WORK AND PERSONAL LIVES

Nurses and midwives have direct and sustained patient contact and therefore, are at increased risk of COVID-19 infection. Consistent with this, the main concerns reported by nurses and midwives in this study and others conducted during the COVID-19 pandemic were the impact of COVID-19 on their own health and the risk of infecting others particularly their family, friends and colleagues.[3,5,36,45] These concerns reflect the substantial proportion of healthcare workers who had been infected with COVID-19 at the time of the study. As of August 2020, 2,692 COVID-19 cases had been diagnosed in Victorian healthcare workers with nurses reporting more cases than medical practitioners and at least 89% of the nurse cases were acquired at work, mostly in hospital settings.[46]

STRENGTHS AND LIMITATIONS

A large and diverse sample of nurses and midwives working in four different Victorian health services during the COVID-19 pandemic in Australia was surveyed for this study. A validated psychometric instrument, the DASS-21, was used to assess symptoms of depression, anxiety, and stress. The study is limited by the cross-sectional survey design, which cannot reveal causal relationships. The study was conducted at four large metropolitan health services in Melbourne and therefore, may not be generalisable to rural health services or those in other states of Australia or countries.

CONCLUSION

The COVID-19 pandemic has had a considerable impact on the psychological wellbeing and work and personal lives of nurses and midwives working in acute care settings in Melbourne, Australia, despite the relatively low number of COVID-19 cases and deaths in this country. Nurses and midwives, particularly those with less clinical experience, would benefit from additional, targeted, and ongoing support and systemic wellbeing initiatives during the current and future pandemics.

IMPLICATIONS FOR NURSING AND HEALTH SERVICES RESEARCH, POLICY, AND PRACTICE

The findings of this study suggest that nurses and midwives, particularly those with less clinical experience, would benefit from additional, targeted support and ongoing wellbeing initiatives that assist them to address their personal and work concerns. As suggested by the World Health Organization, less experienced nurses and midwives may benefit from being partnered with more experienced colleagues who can provide support and monitor their stress levels.[47] Managing the concerns and wellbeing of nurses and midwives is important in attracting and retaining staff and ensuring they can provide high quality patient care.

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CASE STUDIES

Recognising patients at risk of deterioration and dying on general medicine wards: a nurse-led point prevalence study

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ABSTRACT

Objective: To trial the Supportive and Palliative Care Indicators Tool (SPICT) as a nurse-led initiative to describe the supportive and palliative care needs of patients in the acute general medical ward. Patient deaths within the subsequent 12 months were identified.

Background: National standards specify recognition of patients at risk of deterioration and dying as essential to ensure high quality and safe end-of-life care. However, the timely recognition of these patients in acute medical wards is often complex and inherently uncertain.

Method: A point prevalence study assessed the supportive and palliative care needs of patients admitted to the general medical wards of a major public tertiary hospital in a single day. A nurse-led team used the SPICT and the Surprise Question to assess patients. Patient deaths were identified one year following assessment.

Results: Most admitted patients (n = 40, 93%) exhibited at least one advanced disease and two indicators of general deterioration on assessment. Of these patients, 40% died within one year. Only one patient was referred to the hospital-based palliative care service at the time of assessment.

Conclusion: The SPICT identified a high prevalence of supportive and palliative care needs among general medicine inpatients. The use of the SPICT as a nurse-led initiative provides an opportunity to identify patients at risk of deteriorating and dying while also recognising areas of unmet need.

Implications for research, policy, and practice: The SPICT can be effectively administered by nursing teams to assist with the identification of patients who may be at risk of deteriorating and dying so that appropriate end-of-life care decisions can be considered. Further work is needed to develop supportive measures to assist home teams in the identification and response to patients at risk of deterioration and dying in acute hospitals.

What is already known about the topic?

- Accreditation standards specify that hospitals are required to promptly recognise patients at high risk of deteriorating or dying within 12 months.
- The timely recognition of these patients is often complex and inherently uncertain in the acute medical setting.
- The Supportive and Palliative Care Indicators Tool (SPICT) can help multidisciplinary teams identify patients who may be at risk of deteriorating and dying in all care settings.

What this paper adds

- This snapshot study revealed >90% of patients admitted to our general medical wards presented with advanced disease and indicators of deterioration. Forty percent of these patients died within 12 months following their admission.
- The SPICT can be effectively administered by nursing teams to assist in the recognition of these vulnerable patients so that appropriate end-of-life care decisions can be considered.

Keywords: Deterioration; dying; general medicine; palliative care; supportive care

OBJECTIVE

This study trialled the SPICT as a nurse-led tool to describe the supportive and palliative care needs of patients admitted to the general medical wards of a major public tertiary hospital. Patient deaths were identified within the subsequent 12 months following admission.

BACKGROUND

The timely recognition of patients who are at risk of dying is often complex and inherently uncertain.[1,2] Compared to cancer, non-malignant conditions often present greater challenges in identifying patients at risk of dying, as the typical illness trajectory comprises a gradual deterioration in health and functional status with only occasional acute exacerbations requiring a visit to hospital.[3]

The burden of suffering at the end of life can be considerable when dying is not expected, affecting not just the patient but also their families. Palliative care is proven to offer individuals and families better quality care by providing effective symptom management and psychosocial support, reducing hospitalisations, and limiting the use of non-beneficial treatments at the end of life.[4–6] However, prompt and accurate identification of the deteriorating patient is essential so that these systems can be put in place to provide the most benefit.

Australian accreditation standards specify that hospitals are required to accurately and promptly recognise when a patient is at high risk of deteriorating or dying within the next 12 months.[7] A recent national audit showed >70% of hospital patients had documentation suggesting dying was recognised by a clinician but this occurred on average only one day before death.[8,9] Furthermore, 66% patients had potentially non-beneficial and invasive medical procedures performed in their final 48 hours of life.[8] These findings are reflected internationally demonstrating wide-spread challenges in the management of dying people in hospital.[10,11]

At present, there is no systematic way to identify deteriorating and dying patients in acute medical wards. This problem is exacerbated by issues surrounding clinician experience working with deteriorating and dying patients,[8] confidence in identifying the deteriorating patient,[12] coordination between clinical teams, and communication with the patient and family.[9]

The Supportive and Palliative Care Indicators Tool (SPICT) was developed to help multidisciplinary teams identify patients at risk of deteriorating and dying in all care settings.[13] As a prognostication tool, the SPICT has been shown to lack the necessary sensitivity and specificity for accurately identifying dying patients.[14] However, in combination with the Surprise Question,[15] it can still be a useful support for clinicians to gauge patients at risk of dying within the next 6-12 months, and who may have supportive care needs and could benefit from palliative care intervention. This SPICT can be readily completed by nursing staff, who often spend the most time caring for the patient. The use of the SPICT in this context has shown to increase nurses' confidence in identifying and responding to patients approaching end of life,[12] and can subsequently support and inform discussions with medical teams when deciding on appropriate care pathways.

This study trialled the use of the SPICT as a nurse-led assessment to describe the supportive and palliative care needs in a 'snapshot' of patients admitted to hospital on a given day. Patient deaths were recorded 12 months following assessment.

METHOD

SETTING AND PARTICIPANTS

A point prevalence audit was undertaken in two dedicated general medicine wards at a major 800 bed tertiary hospital in metropolitan Melbourne, Victoria. All adult patients (≥18 years) admitted on 16 May 2017, were included in the study. This date was chosen as hospital activity was less likely to be influenced by extreme seasonal conditions or public holiday periods. This study was approval by the institutional ethics committee (project QA013/17).

DATA COLLECTION

A palliative care nurse practitioner and senior ward nurse extracted information from patient medical records and routinely collected hospital patient administration datasets to inform the SPICT.[16] Information captured included patient age and sex, diagnoses, healthcare utilisation, performance status, and indicators of general deterioration (Table 1). Additionally, treating medical registrars were asked the

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TABLE 1: PATIENT DEMOGRAPHICS

	N = 43
Age (median [IQR])	79 years [74.5 – 85.5]
Sex (male)	28 (65%)
Length of stay (median [IQR])	11 days [6 – 17.5]
Life-limiting conditions	
Cancer	11 (26%)
Dementia/frailty	13 (30%)
Neurological disease	9 (21%)
Heart/vascular disease	38 (88%)
Respiratory disease	14 (32%)
Kidney disease	9 (21%)
Liver disease	7 (16%)
Other non-reversible conditions with poor outcomes	34 (79%)
Indicators of general deterioration	
Deteriorating performance status	16 (37%)
Poor performance status	14 (33%)
Unplanned admissions in last 12 months (median [IQR])	2 visits [1 – 3.5]
Dependent	31 (72%)
Person's carer needs help and support	14 (33%)
Progressive weight loss/underweight	10 (23%)
Persistent symptoms	24 (56%)
Patient/family request palliative care	2 (5%)

IQR = interquartile range

Surprise Question for all patients under their care. This binary question asks whether they "would be surprised if the patient died within 12 months".[15] Patient death status was recoded 12 months following assessment from hospital records and cemetery registry searches.

ANALYSES

Data were entered into a database and checked for inconsistencies. Categorical data were presented as frequencies and percentages. Medians and interquartile ranges were used to describe age, length of stay, and number of previous hospital admissions.

Patients were classified as SPICT-positive (SPICT+) if they had two or more general indicators of deterioration AND one or more advanced diseases outlined in the SPICT.[13,16] This classification has been validated previously in a geriatric population representative of our study cohort.[17]

RESULTS

Forty-three adult patients were admitted under general medicine on the day of assessment (Table 1). These people were generally older (median 79 years) and predominantly male (65%), with a median length of stay of 11 days. Most (98%) had presented to hospital with unplanned admissions in the previous 12 months (median 2 visits).

PREVALENCE OF SUPPORTIVE AND PALLIATIVE CARE NEEDS

Seventy percent of patients presented with either deteriorating or poor performance status (Table 1). The most common life-limiting conditions included heart/vascular disease (88%), respiratory disease (32%), dementia/frailty (30%), and other non-reversible condition with poor outcomes (79%). Most patients (72%) were dependent on other family members on aspects of daily living, half (56%) presented with persistent symptoms, and 33% of all patients' carers reported needing help and support.

Forty patients (93%, CI = 0.81-0.98) were identified as being SPICT+. Ninety percent of SPICT+ patients exhibited ≥3 indicators of deterioration.

Sixteen SPICT+ patients (40%) died within 12 months. In response to the Surprise Question, medical registrars indicated that they would not be surprised if 22 of SPICT+ patients (55% of SPICT+ cohort) died within one year. Thirteen of these patients died (81% of all deceased within one year). Of all decedents, only one (6%) was known to the hospital-based palliative care service at the time of assessment.

DISCUSSION

Our findings are consistent with global trends showing that older people are living with more comorbidities.[18] The SPICT identified that the overwhelming majority of patients admitted to our general medical wards had non-malignant life-limiting illnesses, reduced performance status, and multiple signs of general deterioration. Consequently, 40% of patients died within the first 12 months, of which only one was known to the palliative care team at the time of assessment.

The findings from the SPICT assessment suggest that the need for supportive and palliative care intervention is high in this sample. However, clinical effort is often specialised and focused on maintaining delicate balances in medications and other treatments to compensate for patients' myriad of comorbid conditions. With the addition of hospital bed flow pressures, it is not surprising that home teams find identifying patients at risk of deterioration and dying challenging in this context.

Clinicians in our study reported that they would not be surprised if 55% of patients (subsequently identified as SPICT+) died within 12 months. While this suggests some level of recognition of deterioration and dying, it is likely that clinicians are often not confident in their prediction or how to respond. This is supported by previous work showing clinician prognostication of patient death is often unreliable, especially in non-malignant populations[1–3]. Additionally, misconceptions that palliative care is only for terminal care often leads to late referrals.[19] Screening tools like the SPICT in conjunction with the Surprise Question can assist clinicians in identifying people who would benefit from early palliative care intervention[20].

Certain limitations were identified from this work. The relatively small sample size in this point prevalence study affects the generalisability of these findings to the broader population. Further work is needed to investigate the sensitivity and specificity of this screening approach in a larger study. Additionally, any systematic implementation of screening assessment will require a suitable clinical response piece co-designed with the relevant treating teams.

While effective in identifying palliative and supportive care needs, the SPICT, like other screening tools, requires manual assessment of each patient. This is perhaps the biggest barrier to adoption in our already busy hospitals. Mechanisms need to be considered where existing hospital-based electronic patient information can be used to automatically inform items in screening tools, therefore reducing the burden on nursing staff.

CONCLUSION

This point prevalence study trialled the use of the SPICT to describe supportive and palliative care needs among the general medicine inpatient population. The SPICT identified that most patients presented with multiple indicators of deterioration and the need for support. Only one patient was known to palliative care at the time of assessment despite 40% of SPICT+ patients dying within 12 months. The use of the SPICT as a nurse-led initiative provides an opportunity to identify patients at risk of deteriorating and dying while also recognising areas of unmet need. However, further research in this space is warranted to assess feasibility and effectiveness if it were to be incorporated in routine care.

IMPLICATIONS FOR RESEARCH, POLICY, AND PRACTICE

In order for screening and prognostication tools to be effective, they need to have clinical utility.[21] The benefit of using a tool such as the SPICT is that, in addition to identifying patients at risk of deteriorating and dying, areas of unmet need can be identified for clinical teams to proactively respond to. The use of the SPICT in this context has also shown to increase nurses' confidence in identifying and responding to patients approaching end of life.[12] These tools can also promote preliminary dialogue between clinicians, patients, and families regarding the benefits of holistic care, changes in current treatment goals, and palliative care referral, if appropriate.[22]

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