AJAN

AUSTRALIAN JOURNAL OF ADVANCED NURSING

VOLUME 41, ISSUE 3
JUN – SEP 2024

ISSN 1447–4328
DOI 2024.413

An international peer-reviewed journal of nursing and midwifery research and practice

IN THIS ISSUE

The *Australian Journal of Advanced Nursing* is the peer-reviewed scholarly journal of the Australian Nursing and Midwifery Federation (ANMF). The Mission of *AJAN* is to provide a forum to showcase and promote a wide variety of original research and scholarly work to inform and empower nurses, midwives, and other healthcare professionals to improve the health and wellbeing of all communities and to be prepared for the future.

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EDITORIAL

"Cultivating understanding": Navigating the complexities associated with medicinal cannabis and implications for nursing practice

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In February 2016, the Australian Parliament legalised medicinal cannabis (MC) through the passing of the *Narcotic Drugs Amendment Act 2016*, which outlined the regulation overseeing the cultivation, production, and manufacture of cannabis for medical or scientific purposes.[1] This announcement came 12 months after the death of Dan Haslam, a young man from Tamworth who was utilising illicit cannabis for therapeutic purposes to manage the debilitating chemotherapy-induced nausea and vomiting (CINV) he experienced whilst battling bowel cancer. Alongside his mother Lucy, a retired registered nurse, they advocated and lobbied tirelessly to make such change possible; for this reason, the aforementioned Act was also named "Dan's Law" in his honour. While the Act was implemented 8 years ago, numerous challenges still exist for prescribers (medical doctors and nurse practitioners) as well as those, such as nurses, who provide patient healthcare in primary and community healthcare settings.

The *Cannabis* genus exhibits a broad phytochemical profile, with over 100 different cannabinoids such as cannabidiol (CBD) and delta-9-tetrahydrocannabinol (THC), and over 200 different terpenes.[2] Currently, MC products in Australia are typically standardised to contain one or more cannabinoids, mainly CBD and THC, which have been the primary focus of the majority of research over the last 60 years.

CBD is a non-intoxicating cannabinoid and demonstrates anticonvulsant, analgesic, neuroprotective, anxiolytic, and anti-inflammatory activity,[3] whereas THC, commonly associated with the characteristic feeling of being "high", demonstrates analgesic, anti-emetic, orexigenic, muscle relaxant and hypnotic actions.[4,5] These two cannabinoids are prescribed in varying concentrations and ratios across the vast majority of products available to Australian patients, with CBD-dominant, balanced CBD and THC, or THC-dominant products being primarily prescribed clinically according to current Therapeutic Goods Administration (TGA) data.[6] CBD is classified as an S4 prescription-only medicine when products contain at least 98% CBD and 2% or less of other cannabinoids, whereas THC-containing products are classified as S8 controlled drugs. MC products are further described in categories, which have been outlined in Table 1. It's crucial to point out that our understanding of what phytochemical compounds may be of medical interest within the *Cannabis* genus is constantly evolving, and it is likely that other minor cannabinoids, such as cannabigerol (CBG), cannabinol (CBN) and cannabichromene (CBC), or other classes entirely, such as the flavonoids (e.g. cannflavins), may also play an important role across different pharmacological targets and subsequent clinical indications.[7]

https://doi.org/10.37464/2024.413.2096

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Being an unapproved medicine, MC is accessible *via* 4 main pathways: the Special Access Schemes (SAS) A or B, the Authorised Prescriber (AP) Scheme or through participation in clinical trials.[6] SAS-B applications for MC usage in Australia are reviewed and approved by the TGA, with the prescriber needing to supply a suitable clinical justification, often including the failure of front-line medicines for the clinical indication being treated. Of the over 100 indications that MC has been approved for through the SAS-B pathway, the top 5 (in order of prevalence) include chronic pain, anxiety, sleep disorder, cancer pain and symptom management, and post-traumatic stress disorder (PTSD).[8] Whilst, historically, the majority of MC has been prescribed through the SAS-B pathway,[9] it should be noted that there are also two registered MC products in Australia; Sativex and Epidyolex,[10,11] approved for Multiple Sclerosis (MS), and as an adjunct for seizures associated with Dravet and Lennox-Gastaut syndromes, respectively. Given the wide range of indications MC can be prescribed for in Australia, it is highly likely that nurses will come across these botanical medicines whether working in aged care, community, or hospital settings.

Currently, to the best of our knowledge, NPs can prescribe S4 and S8 MC products *via* the Special Access Scheme (SAS) B pathway in South Australia, Northern Territory, Victoria, Queensland, New South Wales, and the Australian Capital Territory. Western Australia currently only permits NPs to prescribe S4 products, whereas Tasmanian-based NPs cannot prescribe any MC-based products at all. Furthermore, NPs are not eligible to access the Authorised Prescriber scheme, which allows medical practitioners to apply for approval for a specific unapproved MC product for a specific clinical indication and requires Human Research Ethics Committee approval or endorsement from a specialist college.

TABLE 1: MEDICINAL CANNABIS BY CATEGORY[12]

Category	Descriptor
1	CBD medicinal cannabis product (CBD≥98%)
2	CBD dominant medicinal cannabis product (CBD≥60% & <98%)
3	Balanced medicinal cannabis product (CBD<60% & ≥40%)
4	THC dominant medicinal cannabis product (THC 60% - 98%)
5	THC medicinal cannabis product (THC>98%)

One of the major clinical challenges is that cannabis, when used medically, is a complex intervention,[13] where, unlike most pharmaceuticals, there are likely to be multiple components contributing to potential therapeutic outcomes *via* polypharmacy.[14] This means that a 15% THC-containing product manufactured by one company based on a particular cannabis chemovar/variety (sometimes incorrectly referred to as a strain) may have quite different effects to a 15% THC product made by another company utilising a different chemovar/variety, as the overall pharmacological profile may be very different due to differences in the presence or ratio of other minor cannabinoids (e.g. CBN and CBG), and terpenes, all of which are proposed to have therapeutic effects.[15-17] While there is little evidence in the literature, both doctors and consumers have commented that while one product works for them, another one that is identical in terms of THC or CBD percentage does not. As such, this phytochemical complexity can be seen as both a strength and a weakness in the application of MC clinically. Another clinical challenge is that unlike most pharmaceutical drugs, which are developed from a top-down approach, starting with biological mechanisms, and working through various *in-vitro, in-vivo* and clinical studies to determine dosage, safety and efficacy, medicinal cannabis is already in the marketplace, and therefore a bottom-up approach is occurring, where research is working backwards to determine dosing, mechanisms, and efficacy. This is similar to other interventions that have not gone through a "pharmaceutical" development process including most herbal/complementary medicines and treatments such as acupuncture.[18] A key area where this impacts clinicians is that dosage forms (e.g. oral oil *versus* inhaled cannabis) impact the onset of effect and duration of effect and that dosage ranges are often tailored to individuals using a 'start low, go slow' approach to dosage finding rather than using a set dosage as would occur in more traditional pharmaceuticals.[19]

According to TGA data, the two primary dosage forms utilised across Australia are inhaled dried flower and oral oils.[6] Inhalation of cannabinoids and terpenes *via* vaporisation of dried flower provides a fast onset of action, typically within 5-10 minutes, but a short duration of effect, ranging between 2-4 hours.[3] Conversely, oral oils have a delayed onset of effect, ranging between 30-90 minutes, but a longer duration of effect of approximately 6-8 hours.[3] Additionally, cannabinoids and terpenes are highly lipophilic (fat-loving), and generally have low bioavailability, typically between 20-30% when used orally and 10-60% when inhaled,[3] adding another layer of complexity for both manufacturers and clinicians alike whether that is researching different methods to improve cannabinoid absorption characteristics, or optimising dose titration for patients.

Another added complexity facing MC prescription is that cannabis inhabits a unique place in Australia, being both an illegal drug and a legal medicine, and due to this, there are challenges associated with current drug-driving laws and workplace drug-testing policies. Across all Australian States and Territories bar one, the mere presence of THC in bodily fluids, irrespective of driver impairment or legal MC prescription, constitutes a criminal offence, with the only exception being Tasmania, where drivers using a legally prescribed MC product may not be charged if there are no signs of driver impairment. No test kit is currently available that can quantify the impairing effects of THC (like that of a breathalyser for alcohol), and due to the fact

 https://doi.org/10.37464/2024.413.2096

cannabinoids like THC are highly lipophilic, they can stay in the body for days to weeks depending on several factors, such as how often and how much cannabis is ingested, body fat percentage, and the sensitivity of the drug test being administered. Similarly, many employment sectors subject staff to routine drug testing, including defence, transport, building and construction, aviation and mining sectors, for which THC is a tested substance. Positive test results may result in termination of employment, regardless of whether MC is legally prescribed or not. As such, the impact of current drug-driving laws and workplace drug-testing policies are important clinical touch points to discuss with patients prior to MC commencement, which can in turn not only impact patient accessibility but may also contribute to reduced participant recruitment in clinical trials where THC is an investigational product.

Like any medicine, MC also has potential side effects, contraindications and drug interactions which are critically important for patient safety. Cannabis, whether illicitly or medically sourced, should be considered contraindicated in pregnancy and lactation due to a lack of available safety data, with a recent review citing potential for adverse maternal, foetal and long-term childhood development – largely due to the THC component.[20] Whilst more research in this field is urgently needed, THC can easily pass through the placenta, and due to its lipophilicity and low molecular weight, can also pass into breastmilk.[21] Moreover, cannabis has numerous clinically relevant side effects reported in the literature, from the most common such as drowsiness, dizziness, dry mouth, eye redness and cognitive effects, to the more rare orthostatic hypotension, psychosis, tachycardia and cannabis hyperemesis syndrome.[3] On the topic of psychosis, recent media reports suggest an increase in people utilising MC being admitted to hospital with psychosis across Australia,[22] with concerns being raised such as MC being too easy to access, particularly due to the advent of MC-specific telehealth clinics, a lack of evidence for certain clinical indications and irresponsible prescription practices by certain medicinal practitioners. Whilst acknowledging these concerns as potentially valid, a 2022 systematic review investigating the prevalence of long-term and serious harms associated with medicinal cannabis in chronic pain patients reported that very low certainty evidence suggests that adverse effects are common (26%; or 1 in 4 participants), but that serious adverse effects, including those that lead to discontinuation, accident, injury or dependence and withdrawal syndrome are less common, occurring in fewer than 1 in 20 people.[23] Other important clinical considerations are the impacts of cannabis use disorder, and addiction/dependence potential, with greater risk associated with THC-containing products, as CBD has little addiction potential.[24] Reported side effects are typically greater for higher THC dominant products compared to CBD dominant products, however, low and slow dosage titration under close medical supervision may mitigate the majority of these side effects from presenting clinically.

Currently, the majority of evidence relating to cannabis and drug interactions is based largely on *in-vitro* and *in-vivo* studies,[25,26] with the relevance and impact of such experimental findings still needing to be elucidated to determine the extent of clinical impact. Despite this, pharmacodynamic and pharmacokinetic are possible with MC products, although these are mostly theoretical or come from limited case reports.[27] THC exhibits more potential for pharmacodynamic interactions than CBD, particularly when co-administered with pharmaceutical agents related to analgesia and sedation (e.g. antihistamines), and other non-prescribed depressants such as alcohol. Conversely, CBD is more of a pharmacokinetic interaction risk and can inhibit certain enzymes that are involved in drug metabolism *via* the liver, namely CYP2C19, CYP2D6, CYP2C9 and CYP3A4 isoenzymes.[27,28] A recent systematic review in 2022 identified 19 pairs of drug interactions associated with MC, with one pair being a level 1 interaction (very high risk - warfarin) which may require medication adjustment and monitoring of the patients international normalised ratio (INR), and two pairs at level 2 (high risk - buprenorphine and tacrolimus).[27] Due to the fact that pharmacokinetic interactions are largely unpredictable until observed clinically, they are of far greater clinical concern, particularly for medicines that are classified as being of narrow therapeutic index, where the difference between the amount needed for benefit *versus* the amount that will cause harm are small.

Substitution effects, where prescribed medications are reduced or stopped entirely due to the effect of MC, are commonly reported amongst patient groups.[29-32] A common class of medication that is reduced with MC usage in those with chronic disease are opioid-based medications. Whilst such substitution effects, or pharmaceutical deprescribing, is potentially encouraging considering the side effect profile and addictive potential, a cause for concern is that many of these reductions or stoppages are done without the knowledge of the prescribing health professional.[30] This can be further exacerbated by the fact that many GPs are not comfortable managing MC prescriptions,[33] meaning that many patients may be accessing their medicinal cannabis from health practitioners who are not their normal primary care provider, such as telehealth cannabis clinics; one of our recent studies found that only 8% of people with endometriosis using medicinal cannabis were accessing this via their usual GP, compared to 63.5% using a cannabis clinic doctor.[34] When this is combined with difficulties in getting an appointment with a GP, or even having a regular GP to begin with, issues with polypharmacy and withdrawing from medications can be potentially problematic. Depending on the class of drug, abrupt cessation after long periods of usage can lead to withdrawal symptoms that range from unpleasant to potentially fatal.[35,36] A key factor in this lack of communication is that cannabis is not yet normalised as a medicine, and stigma is often associated with its use, with disapproval, marginalisation and discrimination, along with

 https://doi.org/10.37464/2024.413.2096

a loss of social status from the wider population, commonly described by those consuming MC.[37,38] The impact of cannabis-associated stigma has also been reported by other Australian research teams,[39] showing much is yet to be done to address the impact of stigma associated with this now legal medicine. This reduction in stigma is an area that nurses can, and do, provide a powerful voice in addressing through both education and advocacy.

To date, there has been a paucity of evidence on medicinal cannabis and the impact nurses have in its clinical application. However, a cross-sectional study of Israeli and American (i.e. USA) nursing students (n=387 / 87% female) reported that they would recommend cannabis as an option to their patients (91%) if allowed to do so, and believed that MC was associated with benefits to both physical (93.5%) and mental (87.8%) health.[40] Additionally, the majority of respondents reported that they had not received any formal education related to MC in their training programs, and highlighted the importance of MC education for nurses both in academic and clinical curricula,[40] a point further supported by other studies.[41-43] Whilst guidelines relating to nursing care and MC are sparse, the National Council of State Boards of Nursing in the USA has published guidelines on this topic in 2018,[44] and the Australian Cannabis Nurses Association (ACNA) have outlined the scope and standards of practice related to MC in 2023.[45]

Cultivating understanding about MC, and its integration into nursing practice, requires a multifaceted approach that should prioritise patient safety, education, and advocacy. Open dialogue with patients about cannabis consumption is vital to break down the negative effects of stigma, but also identify their concerns, treatment goals, preferences, and to manage expectations. Nurses can play a pivotal role in providing evidence-based education to patients and their families, and fellow HCPs, allowing for greater collaboration and more informed decision making. For nurses that are interested in learning more about MC as a medicine, the Australian Cannabis Nurses Association is a useful starting point to start the educational journey into this ancient, but still controversial, botanical medicine.

DISCLOSURES

As a medical research institute, NICM Health Research Institute receives research grants and donations from foundations, universities, government agencies, individuals, and industry. Sponsors and donors also provide untied funding for work to advance the vision and mission of the Institute. JS is a recipient of a Western Sydney University Postgraduate Research Scholarship and is a current member of the scientific advisory board of United in Compassion (*pro bono*) and a founding board member of the Australian Medicinal Cannabis Association (*pro bono*). JS also sits on the steering committee for Cannabis Clinicians Australia (*pro bono*) and is employed by the Australian Natural Therapeutics Group. MA is a member of the Endometriosis Australia Clinical Advisory Committee, has done consulting work for Evolv Therapeutics and Hazel outside the submitted work, and undertakes clinical trials on medicinal cannabis for Endometriosis funded by the Victorian Government and philanthropic donors. MP is a Registered Nurse/Midwife working in public health, a PhD Candidate at Western Sydney University, a Member of the Australian College of Nursing, and a member of the advisory group for the National Action Plan on Endometriosis and related projects.

Acknowledgements: The authors wish to thank Lisa Dick (NP) and Jodie Davis (RN) for their assistance in providing information relevant to nursing practice in this article.

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Australian Journal of Advanced Nursing 41(3) • 2024.413.1200

Running nurse-led clinics: A qualitative descriptive study of advanced practice nurses' experiences and perceptions

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ABSTRACT

Objective: To explore advanced practice nurses' experiences and perceptions of running nurse-led clinics in the Australian context.

Background: Advanced practice nurses consult with patients through nurse-led clinics to address ever-growing clinical demands and healthcare workforce shortages. Their experiences and perceptions of running nurse-led clinics are vital, but studies offering insights into this area are scarce.

Study design and methods: This study adopted a qualitative descriptive design. Using purposive and snowball sampling methods, ten semi-structured individual virtual interviews were conducted with advanced practice nurses who run nurse-led clinics in Australia. Interviews were audio recorded and transcribed verbatim. Data were analysed using thematic analysis. Reporting of this study adhered to Consolidated Criteria for Reporting Qualitative Research guidelines.

Results: Three themes were constructed: 1) the genesis of nurse-led clinics; 2) perceived positive outcomes of nurse-led clinics; and 3) contextual determinants influencing nurse-led clinics. Findings show that nurses establish, manage, and expand nurse-led clinics to fulfil health service demands and patients' care needs. Though advanced practice nurses reported positive outcomes, there were several barriers that need to be addressed at all levels.

Discussion: Advanced practice nurses are required to have wide-ranging knowledge and skills across the validated domains of patient care, support of systems, education, research, and professional leadership to be able to provide evidence-based holistic care. Advanced practice nurses face obstacles in running nurse-led clinics with overwhelming workloads and insufficient support. Regular communication with healthcare organisational leadership and collaboration with other healthcare workers is crucial to gain recognition and support.

Conclusion: Nurse-led clinics are a valuable service that should be promoted and recognised. It is the responsibility of healthcare organisations to review current policies and provide necessary support to advanced practice nurses to enable effective and efficient nurse-led services. It is also incumbent upon governments to support funding that enables nurse-led care models across policy, funding, and healthcare levels, spanning macro-, meso-, and micro-levels.

Implications for research, policy, and practice: Advanced practice nurses as participants shared experiences in establishing, running, and expanding nurse-led clinics, that can provide a framework to other nurses wanting to start nurse-led services. Advanced practice nurses are encouraged to promote their work to gain recognition and create awareness of the role of nurses in the provision of nurse-led services. More studies are needed at the global level to understand advanced practice nurses' experiences and the challenges they encounter which will assist in developing the strategies to address these barriers.

What is already known about the topic?

- Nurse-led clinics were introduced to mitigate the shortage of healthcare resources, accommodate increasing clinical demands, and enhance patients' experiences.
- Nurse-led clinics achieve positive outcomes, however, advanced practice nurses face barriers in running nurse-led clinics.
- Studies offering insights into Australian advanced practice nurses' experiences and perceptions of running nurse-led clinics are lacking.

What this paper adds?

- Advanced practice nurses shared experiences in establishing, running, and expanding nurse-led services which can be adopted to guide nurses new to nurse-led services.
- Advanced practice nurses strived to overcome obstacles encountered in running nurse-led clinics. They need support at all levels to implement nurse-led services successfully.
- As this is the first study of its kind in Australia, more research is needed to promote and improve the awareness of nurse-led clinics both in Australia and globally.

Keywords: advanced practice nursing, interview study, nurse clinicians, nurse-led clinics, nurse-managed centres, perspective

OBJECTIVE

Nurse-Led Clinics (NLCs) were developed to bridge care gaps, expand healthcare coverage, and promote health equity in response to growing clinical demand and healthcare workforce scarcity in many countries, including Australia.[1-5] Advanced practice nurses (APNs), as the primary healthcare providers of NLCs, directly impact clinical outcomes and patient satisfaction.[6] However, studies offer limited insights into APNs' opinions and experiences in managing NLCs.[7] This is the first study that explores and describes APNs' experiences and perceptions of running NLCs in an Australian context.

BACKGROUND

According to the International Council of Nurses, an APN is a generalised or specialised nurse who has gained expert knowledge and experience through postgraduate education and is able to demonstrate complex decision-making and clinical competencies at the advanced nursing practice level.[8] The advanced level of nursing practice in Australia encompasses five domains, which are clinical care, support of systems, education, research, and professional leadership.[9-11] The universal understanding of APNs' role, including in Australia, is that APNs work collaboratively within multidisciplinary teams,[12,13] act as resource support for patients and other health professionals,[14,15] promote evidence-based practice,[13,15] lead quality evaluation, assurance, and improvement,[15] and assist in healthcare organisation decision making.[10,15] Moreover, nurse practitioners also incorporate comprehensive nursing and medical skills to assess patients' care needs, initiate treatment, and monitor both acute and chronic health conditions and treatment outcomes independently.[16,17]

In Australia, there are no uniform designations for APNs, the classifications of nursing practice levels and practice profiles are managed by the individual jurisdictions.[18] The most used APN titles are Clinical Nurse Consultant (CNC), established in 1986 in New South Wales,[19] and Nurse Practitioner (NP), implemented in Australia in 2000.[20] Clinical nurse consultants are registered nurses who have a minimal five-year equivalent full-time post-graduate experience and hold a post-graduate qualification in a chosen specialty area.[12] Nurse practitioners are Masters qualified and endorsed by the Nursing and Midwifery Board of Australia (NMBA).[21] Nurse practitioners' practice exceeds the registered nurses' scope of practice as they have the legal authority to independently use diagnostic capacity to assess patients, plan care, prescribe and implement therapeutic interventions, and monitor outcomes.[16,21]

The term "Nurse-led Clinic" is not explicitly and consistently defined in the literature.[3,22] The frequently used definition of an NLC describes it as a type of healthcare delivery model where a nurse with advanced skills and competencies provides specialised care to patients. Nurse-led clinics are typically formalised services with well-defined structures.[23] It is either completely managed and coordinated by APNs or supported by Medical Doctors (MDs).[23,24] Advanced practice

 https://doi.org/10.37464/2024.413.1200

nurses have great autonomy in decision-making, from taking control of a single episode of patient encounter to managing complicated care needs using a holistic approach through nurse-led care.[24] Nurse-led model of care is also seen as a "glue" that connects patients with other healthcare services.[2]

In Australia, both CNC-led clinics and NP-led clinics have shown positive influence and outcomes, such as improved healthcare coverage in rural communities,[25] provided continuity of care,[26] enhanced patient and family engagement,[27] and reduced treatment burdens through integrated chronic disease management.[28] In addition, APNs provide individualised and comprehensive care for patients with minor health issues and chronic diseases, which significantly reduce emergency department visits and acute care admissions.[27]

The authors conducted a scoping review prior to this study and found that previous studies have assessed the impact of NLCs and APNs' roles across various settings; however, studies exploring APNs' views of running NLCs are lacking, with only two Australian studies focusing on the nurses' experiences and satisfaction with working in nurse-led services in specific clinical contexts.[29]

Findings from previous studies have shown that NLCs created opportunities for nurses to expand their knowledge and skills, improved nurses' confidence, and enabled autonomy.[30-32] However, nurses also identified several factors impeding them from performing their role efficiently. For example, heavy workloads with limited support,[33] unproductive teamwork,[34] and more importantly, NLCs were not well recognised and accepted by all healthcare consumers and other healthcare providers.[30,35]

One of the identified barriers in the earlier studies report that MDs questioned APNs' ability to run NLCs without medical training.[31,36] However, nurses in several studies voiced a lack of preservice and ongoing training and support available to upskill.[27,30,37] Most of these studies were either carried out a decade ago or in nations with significantly different social and economic contexts compared to Australia.

Nurse-led clinics in Australia are steadily expanding.[27] It is anticipated that understanding APNs' perceptions and experiences of running NLCs may guide healthcare organisations and policymakers to address the challenges of maintaining and expanding nurse-led services and implement relevant support to optimise APNs' roles and job satisfaction. It is important to explore APNs' experiences and perceptions of running NLCs and the factors that influence the services they offer which this study aimed to investigate.

METHOD

STUDY DESIGN

The researchers adopted a qualitative descriptive methodology to explore APNs' experiences and perceptions of running NLCs. Qualitative descriptive study is a widely used research method in nursing and healthcare research.[38] It requires the researchers to describe and interpret the information directly from the surface of the data collected for the study.[39] The data generated from a qualitative descriptive study illustrates the "who, when, and where of events or experiences".[40] It is most appropriately used when researchers try to understand the nature of an issue from an individual's perspective.[38]

PARTICIPANT RECRUITMENT

The study obtained ethics approval from La Trobe University Human Ethics Low Risk Committee (Ethics Reference Number: HEC21257). Participant recruitment and data collection were conducted from September 2021 to January 2022. Using purposive and snowball sampling methods, any Australian registered nurse who identified as an APN and has been running NLCs was eligible to participate. The study was promoted via Continence Nurses Society Australia website and advertised on a specialist nurses' group discussion forum. Most of the potential participants sent emails or a direct message through the online discussion forum to the primary researcher and expressed their interest in participating. A Participant Information Sheet and Consent Form were provided to potential participants via email. Eleven nurses expressed interest in participating in the study. One nurse did not reply after the initial email. Written consent was signed by all other potential participants before scheduling interviews.

DATA COLLECTION

Data were collected from ten (10) APNs via in-depth individual interviews following an interview guide (Appendix 1) by the primary researcher. The interviews were semi-structured and allowed participants to share views and experiences. The primary researcher conducted two pilot interviews with one of the co-researchers and a peer for practice purposes. Both the co-researcher and the peer are APNs experienced in running NLCs. Following the pilot interviews, some questions were reformulated for improved clarity before participant interviews were conducted. Due to Coronavirus disease (COVID-19) restrictions, all interviews were conducted via an online web platform: Zoom. Interviews were scheduled at a time convenient to both the participant and the primary researcher. Interviews ranged from 25 to 99 minutes. Interviews were audio recorded using a password-protected iPhone. Cloud-sharing options were deactivated during interview recordings. All interviews were transcribed verbatim. Transcribing of the interviews

was guided by practical guidelines from Azevedo et al.[41] All information was deidentified, and pseudonyms were used to ensure anonymity and confidentiality.

The authors followed Hennink et al.'s suggested approach to determine the data saturation.[42] Data collection stopped when there was no new information identified from participants and the emerged themes were fully saturated.[42]

DATA ANALYSIS

Data analysis followed Braun and Clarke's six-step thematic data analysis.[43] Table 1 explains the data analysis process. Reporting followed COREQ-COnsolidated criteria for REporting Qualitative research.[44]

TABLE 1: DATA ANALYSIS PROCESS

Step	Action
Step 1: Familiarizing with data	The best way of immersing self in the data is through the transcription process.[43] Accordingly, after each interview was transcribed into written form by the primary researcher. The primary researcher listened to each interview record three times to confirm the accuracy of the transcripts. All transcripts were read at least twice before moving to the next step of data analysis.
Step 2: Generating initial codes	All transcript content was divided into sections, paragraphs, and sentences, then extracted and grouped in Microsoft Word tables. Every section of extracted data was coded with at least one short phrase.
Step 3: Searching for themes	The primary researcher listed all codes on a Microsoft Word Document. Similar codes were grouped and collated to form meaningful units. The meaningful units which presented same or similar concepts were grouped into sub-themes. Sub-themes were then further grouped into preliminary themes.
Step 4: Reviewing themes	The preliminary themes, sub-themes and meaningful units were reviewed, discussed, and modified during regular team meetings with all researchers involved in this study to ensure data supported each theme and the themes represented the context of the whole dataset.
Step 5: Defining and naming themes	Finally, three themes were constructed and agreed within the research team.
Step 6: Producing the report	This study was reported following COREQ guidelines. Pseudonyms were assigned to the participants when reporting the findings.

TRUSTWORTHINESS

The researchers followed an explanation of Guba and Lincoln's criteria for judging the trustworthiness of qualitative research (Table 2).[45]

TABLE 2: TRUSTWORTHINESS JUDGEMENT FOLLOWING THE EXPLANATION OF GUBA AND LINCOLN'S CRITERIA[45]

Criteria	Criteria Characteristic
Credibility	The qualifications, research experiences and backgrounds of the research team members ensured the credibility of the study. This research team was comprised of clinical nurse consultants with many years of experience of running nurse-led clinics and an experienced qualitative researcher.
Auditability	The auditability was assured through regular research meetings and discussions.
Fittingness	All the interview transcripts were sent back to the participants to review and seek clarification, and to consider the fittingness.
Confirmability	Confirmability was verified through reviewing and editing the findings of the study multiple times by all researchers involved in this research.

RESULTS

Of the ten study participants, five were NPs, four were CNCs, and one was an associate nurse unit manager. Experience of running NLCs varied from 18 months to over 30 years. Participants were from various Australian states including six from Victoria, two from New South Wales, and one from Queensland and Western Australia. Among the ten participants, eight worked in metropolitan areas and two had experiences of running NLCs in both metropolitan and regional areas. In terms of practice settings, over half of APNs worked in public hospitals (n=6), two worked in private clinics, and two worked for both public hospitals and private practice.

Using a thematic analysis process, three themes were constructed: (i) The genesis of NLCs; (ii) Perceived positive outcomes of NLCs; and (iii) Contextual determinants influencing NLCs. Each theme contains two sub-themes which are discussed in detail.

 https://doi.org/10.37464/2024.413.1200

THEME 1: THE GENESIS OF NLCS

This theme covers two sub-themes, which are "The origin of NLCs" and "The evolvement of NLCs".

The Origin of NLCs

In participant interviews, half shared their experiences and provided insights into starting new NLCs. Participants suggested that a new NLC should be set up by preparing a business proposal. It is important to promote the proposed new service and gain support.

> Poppy: When you are really looking at setting up a service… you need to do it from the very beginning. Where is the service gap?… then you can write a plan… work out your aims and objectives… put down all your wishes… You really need to find out who are the key stakeholders… The best is you sell to them and work together…

> Lily: This NLC was co-designed by a number of us… We spoke to all the heads of departments for the different specialties… so we have their support… The main executive people need to give the clearance because they are the ones have the power to make it possible.

Two participants became aware of the benefits of specific NLCs that were established in other health organisations and then replicated in their services.

> Jasmine: back to the very beginning, … the service provided at [hospital name] inspired us. The purpose of this clinic was to reduce the workload for the consultants. I think people were wanting that kind of service…

The protocols that guide APNs in running NLCs are crucial to include in the business proposal. All participants believed protocols are essential to guide APNs to practise safely in NLCs,

> William: Guidelines, policies, and procedures are definitely important to safeguard nurses and also the patients who receive the care…

The Evolvement of NLCs

Participants acknowledged that they altered or expanded NLCs to accommodate changing requirements, individual patients' needs, and their own preferences.

> Poppy: when you end up running a clinic on your own… you can modify it… you can get it the way you want… because of the change in organisational structure… you change the way you run the services…

According to the participants, APNs' scope of practice has been expanded, and some of the tasks that are practised in NLCs used to be performed by MDs. Nurse practitioners manage NLCs completely independently. Although CNCs often work alongside doctors, both also act as mentors to train and supervise junior medical practitioners.

> Heather: When you become an NP, you are learning at a high level… So, patient comes in… I can deal with it by myself… But as a CNC, you might have an NLC, but you are actually… doing a lot more alongside consultants…

> Lily: We are not just sort of like some servant role to doctors, but we can actually be even further or better… We teach interns and registrars… this helps promote that we have our own identity… to play within the healthcare service.

THEME 2: PERCEIVED POSITIVE OUTCOMES OF NLCS

Overwhelmingly, all participants shared the positive outcomes of NLCs, for example,

> Violet commented: Since we started [nurse-led survivorship care clinic], it was just clear. It is a winner for everybody…

This theme is divided into two sub-themes: "APNs' personal and professional gain" and "Optimised patient care".

APNs' Personal and Professional Gain

When participants were asked the question, "What are your experiences and perceptions of running NLCs?" The frequently heard word was "*rewarding*". Participants expressed they "*enjoyed*" *(Iris)* and were "*passionate" (Heather)* about running NLCs, as NLCs increase nurses' *"autonomy" (Iris, Jasmine, Daisy, William)*, provide "*good opportunities to expand horizons" (Jasmin)*, and *"prove workload" (William*). However, participants highlighted that managing NLCs is *"not easy" (Lily)* and *"challenging" (Heather, Iris*), therefore, they must *"work very hard" (Heather)*.

> Iris: I very much enjoyed it… good challenge to push myself out of the normal comfort.

Participants were satisfied with the rapport they built with patients and gained respect from patients, which provided them with a sense of fulfilment and achievement, as evident by Lily.

> Lily: It allows you to use your high level of nursing skills… You also built rapport with patients because you saw them on a regular basis until they were discharged from the service.

Nevertheless, three participants stressed that APNs should be aware of their scope of practice and boundaries when managing NLCs.

> Cherry: I need to be very clear about my boundaries as well as my scope of practice, so I am really not breaching out of my scopes…

Optimised Patient Care

Participants described NLCs as "*give a good opportunity to really check patients" (Violet), "accessible" (Rosie, Lily), "consistence" (Heather, Daisy), "convenience" (Cherry), "holistic" (Cherry, Rosie), "tailored" (Lily) and "make difference to the outcome" (Cherry).*

> Rosie: I make sure they [patients] get time to ask questions and look at their needs… also, all the other aspects of patients' lives. For example, can you go to the pharmacy to get your medication? Are you getting enough exercise? … all the subtle things about patients' general life and recovery from treatments.

Participants were appreciative of patients' positive feedback and the trust they gained from patients. Healthcare organisations also gained recognition from the positive reputation of NLCs.

> Cherry: One of the patients had an injury… I took more than an hour to stitch her. She put on Facebook, "Thank you to the hospital for doing this" … Everyone feels so happy… The hospital is really getting good recognition.

THEME 3: CONTEXTUAL DETERMINANTS INFLUENCING NLCS

This theme consists of two sub-themes: "The enablers of running NLCs" and "The obstacles of running NLCs".

The Enablers of Running NLCs

Participants identified themselves as the enabler of their own NLCs. They also identified ongoing training and support at all levels as key facilitators of running NLCs.

Training and Keeping Current

All participants expressed that APNs need ongoing training and education to keep their knowledge and skills up to date.

> Jasmine: You need a lot of training… very important. You provide them with correct information… Sometimes you also need that sort of confidence to make a decision… that can only be achieved through education and ongoing development.

All participants have offered suggestions on the ways to maintain ongoing professional development and the training opportunities that are available. Mentorship programmes and observing other APNs' or MDs' clinics were recommended by most participants.

> Cherry: Lots of webinars now and online stuff. You can learn whatever you want to know nowadays…
>
> Rosie: I found it valuable to sit in on their [MDs'] consultations to hear the way they conduct… so I could replicate that advice when I talk to patients… In terms of running the clinics itself, I visited centres overseas…

When there were no suitable training programmes available locally, some participants travelled interstate or overseas for training and sought support from international experts. After getting trained, they benchmarked against international guidelines and created training programmes for others.

> Heather: There was an NP who was well published in America. He came out… I went down to do advanced urodynamics training with him in Sydney… I try to go to the international conferences. I did a number of supervised education sessions with my consultants, and now I am running that programme for our clinical nurses… Sometimes… no qualification training available… You have to think that consultants and registrars don't have to take a course to do cystoscopy either…but you have to follow some international guidelines for what you are doing…
>
> Rosie: In terms of running the clinics itself, I visited centres overseas, because certainly in America and UK [United Kingdom], they have been running NLCs much longer than we have here.

Recognition and Support from All Levels

A successful NLC will not be accomplished without recognition and support from organisations and colleagues, especially the MDs. Teamwork significantly enhanced work efficiency. Participants also expressed the importance for everybody to recognise the value of APNs and acknowledge the benefits that nurses can bring to the service.

> Rosie: You need to have that support from every member of the staff, from medical, nursing, and admin… Everyone has equal support provided to NLCs that provided for traditional medical clinics.

Eight out of ten participants expressed they actively engaged with managers and colleagues. Regular communication helps build trust, respect, and collegial relationships, as an example from William.

> William: I worked well with all my peers, both nursing and medical, also allied health… good communication…, is extremely important.

Most of the participants in this study received support from their medical colleagues. Three participants heard that some MDs were reluctant to collaborate with APNs. Participants provided strategies on how they gained trust and support from MDs.

> Rosie: Some of them don't actually have relationships with nurses to feel confident to passing on aspects of care to the nurses… Make sure you include them [MDs] in correspondence, so they are aware of what you advised the patient… they feel comfortable including you in the patients' correspondence …

> Iris: Sometimes doctors think they have covered everything, but when you encourage: I can spend more time… go through more detail that you advised them …. They are like… perhaps I should refer…

The Obstacles of Running NLCs

Participants identified obstacles of running NLCs, which are summarised as "Inadequate preparation" and "Lack of support and role awareness".

Inadequate Preparation

Three participants identified lack of patient engagement, resulting in patients not coming prepared for nurse appointments, as one of the barriers of running NLCs, according to William's excerpt:

> William: If patients refused to engage with the NLC, either because they don't want to engage in general or don't see the value of a nurse doing the reviews instead of a doctor… refusing to do their own preparations… can make things a lot slower.

To encourage the engagement with patients, both Poppy and Rosie provided the strategies they have used.

> Poppy: You need to make sure your limitations are… You do not hang on to the cases… in that way, patients will respect you… It's about how you approach your patients. Patients have every right to say, I don't want to see you, I come to see a doctor… You really need to know what to say… Sometimes you need to address the family member, who is more stressed than the patients.… It's about controlling the situation, all that comes from experience, knowledge…
>
> Rosie: I make sure…, all the correspondence says, coming to see nurse… You just have to respect, then [tell patient] certainly you can go back to the doctors, before you do that, this is what I can talk to you today, might be also helpful for you…, just try to show what you can offer them as well.

Participants raised the issue of inadequately trained nurses available to run NLCs. One explanation is that nurses have little knowledge about NLCs, and it takes a significant amount of time to train nurses to take on the responsibilities of running NLCs. This results in a lack of succession planning and insufficient absence coverage for NLCs. This is evident by William and Lily's comments:

> William: Unfortunately, if you take any kind of time, there is a steep learning curve for the person filing in. You tend to come back with more work.
>
> Lily: What another thing we come across is a lack of succession planning… to ensure that the service stays… well established. You have to provide opportunities for new beginners to be interested in the area. Because of the short staffing in the ward… nursing staff do not even get a feel of what it is like to work in outpatient service… One of the comments I heard a number of times, You guys are just having a lot of coffees, just sit inside your office.

Participants expressed their willingness to train more nurses; however, the challenge is to find time for clinical teaching, and not many nurses come forward to get trained. Besides, nurses are not fairly treated, government and health organisations should provide better remuneration to attract more nurses to upgrade to APN level.

> Jasmine: If anyone is interested, I am happy to get them on board…I think the organisation should provide sort of… incentives…
>
> Rosie: I think better remuneration… the Medicare rebate for nursing consultations, nothing compared to medical (consultation) rebate.
>
> Cherry: I would spend half an hour… with the patient, do all the education… then we get the GP (General Practitioner) to see the patient, usually the consultation doesn't last more than a few minutes… We identify any problems, and a doctor would say Yep…, then we give the patient the EPC (Enhanced Primary Care plan) … the doctor will probably get out of pocket $250, 300, 400 depending on what the care plan item number is, but we get paid $30 an hour.

Lack of Support and Role Awareness

Participating nurses reported that their workload was high. They were faced with limited time to run clinics efficiently. To overcome this challenge, participants implemented several strategies, as evident by William and Violet.

> William: Sometimes you need to triage patients, to either go to a different service or discharge through General Practitioners (GP) to manage the workload… because the workload is too much.
>
> Violet: We keep getting interrupted with the doctors… Our survivorship clinics… were in a separate area…

Participants also identified a lack of time and funding for professional development and conducting service evaluation as another barrier.

> Daisy: Time would be a big one, and money. What I found frustrating that only a small amount of money is given to nurses for professional development… the audits to make sure everybody has their follow-up… I am doing it in my own time. It is a big barrier. I don't get paid for that…

In contrast, Rosie shared a view that investing resources and personal time in training is an essential component of being a professional.

> Rosie: As far as I am concerned, any training, any costs, it's part of being a professional.

There is a lack of awareness of NLCs and APNs' role in the community, although NLCs are gradually being recognised and acknowledged by the public.

> Cherry: there is a lot of ignorance in the community about our capacity, so you spend a lot of time trying to convince people.

DISCUSSION

To our knowledge, this is the first study that has explored APNs' experiences and perceptions of running NLCs in Australia. This study offered insights into APNs' experiences and perceptions of implementing, running and adapting NLCs to accommodate the changes in healthcare organisations and patients' care demands. Study participants expressed that APNs themselves are the key enablers of their NLCs. They must be current in their knowledge and skills to be able to offer evidence-based care and build positive and collaborative relationships with all levels. This will enable APNs to gain recognition and support to develop and manage NLCs successfully.

Both this study and the previous studies suggest that nurses' scope of practice has been extended in the last few decades.[5,46] Advanced practice nurses are trained and qualified to run clinics in parallel with medical professionals.[47] The foundation of nursing is to provide holistic care, which means nurses consider the individual client as a whole, delivering care with various modalities to facilitate recovery and accountability for their own health.[48] Therefore, APNs need not only comprehensive nursing and medical knowledge for their specific NLCs but also to be highly skilled in communication, psychology, and counselling.[11,47] This study revealed that Australian APNs strive to provide evidence-based holistic and personalised care in NLCs. A holistic approach to care enabled participants to gain recognition and respect from patients.

Unlike other studies reported in countries where NLCs were implemented more recently, participants reported there were deficiencies in the training opportunities available, especially the lack of specialised training programmes.[37,49] However, our study participants mentioned that there are several training programmes available for Australian nurses. Mentorship is consistently reported to be vital in training nurses to run NLCs in both this study and other studies.[6,37] However, time and cost were the main barriers to professional development. Similar findings were reported by another Australian study, which focused on APNs in GP services only, and found that time and financial support were important for APNs to attend professional development, but there was a lack of scholarship opportunities available, and nurses were not willing to pay for ongoing training. In addition, participants were concerned as there was no funding to backfill their role when they applied for leave.[50] When time and cost become barriers for APNs to take preparatory and ongoing training, they may not be able to fully develop their role.[51] This study also revealed a different perspective from participants, that personal investment in professional development is not an issue for APNs, as it is a necessary component of being a profession.

The Australian healthcare system is facing a crisis, primarily due to the rapid growth of people with chronic diseases.[52] The COVID-19 pandemic also exacerbated the burden on the system.[53] Despite increasing government spending on healthcare, with a 6% rise in 2021 compared to 2020 after adjusting for inflation,[54] many individuals still lack access to necessary care. For instance, residents in rural and remote areas experience subpar health outcomes due to limited local healthcare resources and neighbourhood GPs.[55] This has prompted calls for healthcare workforce reform in the Australian healthcare system,[16,46] particularly preparing more nurses to become APNs as these nurses are often the frontline health professionals that patients contact for health issues in rural and remote communities.[16] Nurse-led clinics can be the solution to address these gaps in the healthcare system.[46] Therefore, the government is urged to implement new funding models to support the expansion of APN-led services.[16]

Nurse-led clinics in Australia have demonstrated enhanced patient satisfaction and proven cost-effectiveness.[27,56,57] Patients have consistently reported high levels of satisfaction with the care received in NLCs, often mentioning improvements in their quality-of-life following attendance.[58] A separate Australian study found that nearly 80% of patients reported that nurses always encourage them to share concerns and spend sufficient time with them.[59] The positive experiences reported by patients align with APNs' experiences that were reported in this study, in which NLCs optimised patients' care and enhanced APNs' sense of value and satisfaction. Moreover, APNs had demonstrated rapid responsiveness during the COVID-19 pandemic. They have implemented diverse innovations, ensured the continuity of existing services, and adapted care delivery to meet the demands of the global health crisis, leading to legislation change and enabling NPs full practice authority in the United States.[60]

This study reported that APNs need support from all levels to be able to fulfil their role and be successful in implementing, managing, and expanding NLCs. This study and earlier evidence pointed out that APNs struggle with clinical workload.[61] Although participants in this study shared strategies for managing overwhelming workloads, without support from health organisations, it does not substantively solve the problem. On the other hand, nurses are recommended to record their workload and audit the clinical outcomes as evidence to show their contributions to the healthcare organisation's leadership.[62] Currently, in Australia, there is a lack of funding for the roles and jobs available for the overwhelmed service demand and limited access to the

Medicare Benefits Schedule and the Pharmaceutical Benefits Schedule for NPs.[22,46,63] As nursing workforce shortages around the globe pose a threat to initiating and maintaining NLCs in practice,[31] government and healthcare organisations should enact relevant legislation and implement a sustainable system to avoid staff turnover and attract more nurses working towards APN roles to maintain nurse-led services as raised by the participants in this study.[64]

Support by a multidisciplinary team is another perceived enabler for NLCs as described by the participants. Advanced practice nurses act as a conduit to enable effective communication among stakeholders across different disciplines to solve issues in a systematic way through NLCs.[2,12] Some of the APNs have established strong collaborations with MDs and other healthcare professionals, as the participants mentioned in this study. Medical practitioners highly value the contributions of APNs to the service, as they can address other aspects of patients' care and ensure coordination and continuity. This collaboration allows MDs to concentrate on more complex medical issues.[32,62]

However, some APNs still face challenges in gaining support from other healthcare professionals and the community, especially in collaborating with MDs.[22] This resistance is noted in both the current study and previous literature. A study from the United Kingdom emphasised the persistence of tension between nurses and MDs when nurses try to extend their scope of practice in NLCs.[65] The presence of APNs, especially NPs, has clearly challenged traditional professional hierarchies.[46] A similar phenomenon also exists in Australia. According to NMBA,[66] NPs have the legal authority to practice independently and collaboratively in a multi-disciplinary team. However, when the Australian government recently proposed a bill to remove the collaborative agreements between MDs and NPs and review the scope of practice of NPs,[67] the Royal Australian Colleague of General Practitioners immediately raised an objection.[68] If the bill passes the parliament, NPs' autonomy in providing Medicare services and prescribing medication will be largely increased. It allows NPs to work in their full scope of practice, gain much-deserved respect, and provide patients with timely, better, and more affordable healthcare services.[69] In a scoping review, it was noticed that many studies compared NLCs with MD-led clinics that focused mainly on the clinical domain of APNs' roles rather than with different professional levels. As a result, the evidence often implicitly views the NLCs are medical clinics' substitutes. This perspective fails to recognise the potential of APNs to enhance, augment, or transform services.[70] Earlier evidence identified APNs' role and scope of practice remain ambiguous. This resulted in some MDs being reluctant to refer patients to NLCs, as MDs have little understanding of APNs' role.[70,71] But over time, this may change with greater awareness and trust.[71] Participants in this study discussed the strategies that can be used to collaborate with and gain support from medical professionals, but this will only be effective if APNs themselves are clear on their role.

In addition, although there were conflicting views, that too many protocols may turn nurses' attention away from personalised care,[31] this study has clarified they are fundamental to defining APNs' scope of practice and ensuring the safety of APNs' practice in NLCs. Given the previous study pointed out that the protocols are poorly adhered to,[65] it is essential for APNs, MDs, and nursing supervisors to develop NLC protocols in collaboration. Additionally, APNs must have full knowledge of the Australian healthcare system and clearly identify other stakeholders both within and outside of the organisations to be able to advocate for and navigate care for patients.

Although NLCs have existed for nearly four decades in Australia,[72] some participants in this study still voiced that their role in NLCs is not yet well recognised by all healthcare workers and the public. Nurse-led services in Australia are still in the developing and expanding phases; some haphazard development and a lack of service evaluation have created discrepancies in the understanding of NLCs in the community.[27] Studies exploring ways to increase awareness of NLCs are needed. Future studies may also include healthcare consumers and other stakeholders to obtain a better understanding of their perceptions of APNs and the services APNs offer.

LIMITATION

There are several limitations of this study. The primary researcher who conducted interviews is also a CNC and runs NLCs. There is a possibility that the researchers made assumptions based on their experiences with NLCs during data collection and analysis. However, this was managed by being reflective and adhering to the interview guide.

The sample size of the study is relatively small. There were only ten participants involved in this study. Most of the participants were specialised in the urological and continence fields, with some involved in cancer care. Therefore, the findings may not represent all Australian APNs' experiences and perceptions with NLCs. However, participants were from diverse clinical and geographical settings and offered valuable insights which have global relevance for the improvement and enhancement of nurse-led services.

This study presented a glimpse of Australian APNs' experiences and perceptions of running NLCs. The findings are not generalisable to other parts of the world where NLCs exist. Future studies should consider various clinical contexts, diverse cultures and different nurse-led care models when exploring APNs' perceptions and experiences in running NLCs.

CONCLUSION

This qualitative descriptive study has offered insights into APNs' experiences and perceptions of running NLCs in the Australian context. Participants shared experiences in establishing, running, and expanding NLCs. Although APNs are passionate about running NLCs, they also face several obstacles. This study added knowledge on strategies to overcome the challenges of running NLCs more smoothly, which provides valuable advice to other APNs with similar experiences. Advanced practice nurses need recognition and support from all levels to be successful. The recent reform by the Australian Government to remove the requirement for the collaborative arrangement between NPs and medical practitioners is a promising step forward, but much work remains to be done. To increase the awareness of APNs' role and NLCs, and promote APN-led services, more education and research on nurse-led services are needed.

IMPLICATIONS FOR RESEARCH, POLICY, AND PRACTICE

The results of this study provide practical guidance for APNs who plan to establish NLCs and nurses who are new to running NLCs. It can be used as a reference for countries where NLCs have been more recently introduced. Based on the enablers and obstacles of running NLCs identified in this study, APNs are encouraged to have regular communication with managers and MDs to discuss their preference for running NLCs, seek support to overcome the challenges, and be familiar with healthcare organisations and MDs' expectations for NLCs. Advanced practice nurses are also recommended to formally book every patient encounter in NLCs to record their workload. This is the best evidence to show APNs' clinical activity when seeking more support. To increase awareness and acceptance of NLCs, APNs are encouraged to have a presence on social media and at conferences. It is also imperative for the government and healthcare organisations to listen to APNs' voices, review the current policy, and implement relevant strategies to support and promote APNs' roles and NLCs. In addition, more Australian and international studies are needed to promote NLCs and APNs' roles to improve global awareness.

Acknowledgements: The authors acknowledge the support received from the Australian and New Zealand Urology Nurse Society (VIC-TAS section) and Continence Nurses Society Australia for promoting the study.

Funding support: This study received no grant from any funding agency in the public, commercial, or not-for-profit sectors.

Declaration of conflicting interests: No conflict of interest has been declared by the authors.

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RESEARCH ARTICLES

Breastfeeding mothers' self-confidence: A mixed-method study

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ABSTRACT

Objective: To establish the association of the mother's breastfeeding self-efficacy with infant feeding in the first six months of the child's life and identify the mothers' perception of their confidence to breastfeed.

Background: Breastfeeding is a multi-determined process. Many factors contribute to a mother's ability to exclusively breastfeed until a child reaches six months of age. Among these factors is a mother's confidence in her abilities to breastfeed her baby, referred to as breastfeeding self-efficacy. Thus, self-efficacy for breastfeeding could be an essential predictor of reducing the risk of early weaning.

Study design and methods: This is a mixed-method sequential explanatory study. The short form of the Breastfeeding Self-Efficacy Scale was used to determine the level of the mothers' confidence. 158 mothers were surveyed during their postpartum hospital stay, and 128 were included in a follow-up six months after delivery. Additionally, 22 participants were randomly selected for an in-depth interview (qualitative stage). Data were analysed using inferential statistics and thematic content analysis.

Results: High levels of breastfeeding efficacy were identified during the hospitalisation and after discharge among all participants. Exclusive breastfeeding was practised among 45.31% of mothers six months after delivery. Return to work was a key factor contributing to early weaning. Family and health professional support during the breastfeeding process were associated as crucial for the duration of exclusive breastfeeding.

Discussion: Exclusive breastfeeding for the first six months after delivery involves various factors, such as the mother's confidence in her breastfeeding skills and the specific circumstances she faces while breastfeeding. Thus, through the mixed qualitative and quantitative approaches, it was possible to identify the convergence of self-efficacy scores and the breastfeeding mothers' perception of their confidence and intention to maintain exclusive breastfeeding.

Conclusion: High self-efficacy to breastfeed alone was not enough to maintain exclusive breastfeeding. It is necessary to combine self-efficacy and family or health service support and guidance to clarify the mother's doubts about potential difficulties that may appear throughout the breastfeeding process, the maintenance of lactation when she plans to return to work, and the breastfeeding technique.

Implication for practice: Applying the Breastfeeding Self-Efficacy Scale associated with the breastfeeding mothers' interview during the prenatal and perinatal

period facilitates early identification of mothers at risk for early weaning and helps nurses in planning interventions to support the breastfeeding mother and her child in favour of exclusive breastfeeding duration.

Keywords: Breastfeeding; Confidence; Infant; Mothers; Self-efficacy.

What is already known about the topic?

- Exclusive breastfeeding (EBF) is recommended for the first six months of a child's life; however, many mothers do not follow this recommendation due to multiple barriers such as mental health issues (i.e., postpartum depression or anxiety), educational gaps, physical discomfort like sore nipples, engorgement, return to work, and lack of support.
- Breastfeeding self-efficacy has been associated with the duration of breastfeeding.

What this paper adds

- Breastfeeding mothers' self-efficacy is essential for stimulating maintenance.
- Questions 3 (I always feed my baby without using powdered milk as a supplement) and 11 (I always breastfeed my baby on one breast and then switch to the other) of the Breastfeeding Self-Efficacy Scale (short form) predicted early weaning risk.
- Planning nursing care intervention for breastfeeding mothers in their follow-up after birth should include assessing their breastfeeding self-efficacy and factors that could contribute to early weaning, such as returning to work and the lack of a support network.

OBJECTIVE

To establish the association of a mother's breastfeeding self-efficacy with infant feeding in the first six months of the child's life and to identify the mothers' perception of their confidence to breastfeed.

BACKGROUND

In recognition of breastfeeding's many health benefits for both the mother and infant the World Health Organization recommends that infants are exclusively breastfed for the first six months of a child's life and sustained for up to two years to ensure optimal health for the newborn.1 Exclusive breastfeeding (EBF) refers to the infant receiving only breast milk, and no other liquids or solids, not even water. Despite this recommendation and the recognition of the benefits of EBF, global breastfeeding rates have not increased in the last two decades.[1] The prevalence of EBF among children under six months of age is below 50% in most countries. An analysis of 57 low and middle-income countries showed that the weighted global prevalence of women exclusively breastfeeding up to 6 months was 45.7%.[1,2] Increasing EBF is a multi-determined process. Among these, maternal confidence has been identified as a crucial element for successful breastfeeding during the postpartum period.[3] Maternal self-confidence in breastfeeding is a significant predictor of EBF that should be monitored and supported throughout pregnancy and childbirth.

Breastfeeding confidence is considered a significant variable in the continuation of breastfeeding; however, this concept has suffered from a theoretical perspective in the literature. Self-confidence is defined as personal confidence in effectively performing a task or achieving a particular goal. Related to a mother's self-confidence these tasks refer to child-rearing, such as breastfeeding.[4] Considering the duration of breastfeeding, this characteristic can create a woman's confidence or positive expectation regarding her knowledge and skills to breastfeed her baby successfully.[5,6] To promote the conceptual development of breastfeeding confidence and guide effective supportive interventions, Dennis (1999) incorporated Bandura's theory of self-efficacy and developed the concept of self-efficacy for breastfeeding, creating the Breastfeeding Self-Efficacy Scale (BSES), validated in Brazil by Dodt.[4,5,6] Breastfeeding self-efficacy refers to the mother's perceived ability to breastfeed her baby and predicts whether the mother chooses to breastfeed or not; how much effort will she make in this process; whether she will have self-improving or self-destructive thought patterns regarding breastfeeding, and how she will emotionally respond to breastfeeding difficulties.[5]

Self-efficacy in breastfeeding is influenced by perception of performance (previous experiences with breastfeeding); vicarious experiences (observing other women breastfeeding); verbal persuasion (encouragement of influential people such as family members and health professionals), and physiological responses (fatigue, stress, anxiety, and pain).[4] Nursing interventions to increase self-efficacy are an effective approach to maintaining EBF. Research on support for breastfeeding and health education offered during prenatal care to promote EBF have indicated that self-efficacy for breastfeeding is a modifiable factor.[7] In the daily practice of caring for breastfeeding mothers, health professionals can use tools to assess maternal self-efficacy and identify needs for support in maintaining EBF. The use of the BSES makes it possible to identify maternal difficulties and strengths in breastfeeding, contributing to the planning of effective interventions to encourage the maintenance of

EBF.[8] Nurses could apply the BSES-short form to plan clinical practices with women, in all stages of pregnancy and the puerperal period, acting on exclusive items with low scores to improve self-confidence in breastfeeding. Otherwise, involving family and other people who support women during pregnancy, and counselling about breastfeeding, could help women with self-confidence.

In addition to measuring breastfeeding self-efficacy, it is necessary to capture the mother's perception of breastfeeding. Specific elements of the particular social and family context can influence the maintenance of EBF. Based on these two aspects, the health professional can plan women's health care to improve their confidence in breastfeeding. Health workers could provide support to increase women's self-confidence and take advantage of opportunities during regular prenatal care encounters during pregnancy and childbearing to assess women's breastfeeding difficulties and identify the degree of maternal self-efficacy to encourage women's empowerment for this process.

It is believed that breastfeeding mothers with higher scores on the BSES, which characterises high efficacy for breastfeeding, have a positive perception of their confidence in the breastfeeding process. Thus, this mixed method study aims to establish the association of the mother's breastfeeding self-efficacy with infant feeding in the first six months of the child's life and identify the mothers' perception of their confidence in breastfeeding. A quantitative approach will be used to determine the level of breastfeeding self-efficacy using the BSES-SF and a qualitative approach will be used to identify the breastfeeding mother's perception of breastfeeding self-efficacy.

METHODS

Breastfeeding is considered a complex and multifactorial theme. To explore this, a sequential mixed-methods approach (QUAN-qual) was conducted, according to the methodology developed by Creswell.[9] The mixed aim of this study is to compare the score of the Breastfeeding Self Efficacy Scale – Short Form (BSES-SF) with the breastfeeding mother's perception of her confidence in providing EBF, to identify factors that influence EBF maintenance during the first six months of a child's life.

The study employed a longitudinal prospective cohort design that followed a group of breastfeeding mothers from the immediate postpartum period (24–48 hours after birth) to six months. The exposure variable was the mother's self-efficacy scores, and the outcome variable was breastfeeding exclusively until the sixth month. The quantitative variables analyses were participants' sociodemographic characteristics, like the mother's age, education level, job, marital status, income, prenatal characteristics, such as type of delivery, number of prenatal appointments, vaccines, among others, duration of the EBF, newborn clinical values, as gestational age, weight, cephalic circumference, Apgar index and BSES-SF scores. The perception of the mother about her confidence to maintain exclusive breastfeeding was the qualitative component of the study.

PARTICIPANTS

The participants were enrolled from a teaching hospital in Paraná state, Brazil. The sample's composition followed the precepts indicated for each type of approach, according to the following inclusion criteria: a postpartum woman living in the city of study, given birth between 37 - 42 weeks of gestational age, and not having had clinical or physiological complications in childbirth and during the immediate postpartum period. Complications included diabetes, high blood pressure, haemorrhage, mental disorders, or breast injuries that could have prevented them from responding to the questionnaire and/or prevented them from breastfeeding (reported in the medical records). Adolescent breastfeeding mothers and/or newborns with a known congenital disability, premature infants, multiple pregnancies, as well as newborns hospitalised at the neonatal intensive care unit were also excluded.

STUDY DEVELOPMENT

The study was conducted through two phases: phase I, a quantitative approach and phase II, a quantitative and qualitative approach.

Phase I

Quantitative data was collected from a non-probabilistic sample, consisting of 158 breastfeeding mothers in the immediate postpartum period (from 24 to 48 hours after birth) between June and October 2017.

The researchers contacted the sample in the immediate period after birth and explained to them the purpose of the study. After informed consent was gained, the mothers were given a questionnaire that gathered sociodemographic and clinical data about the newborn and the mother, and the Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF) Brazilian version was applied.

The BSES-SF is a 14-item scale, divided into two subscales: breastfeeding technique and interpersonal thoughts. The *breastfeeding technique* subscale includes questions about the correct position of the baby at the breast, comfort in the act of breastfeeding, recognition of good lactation signs, and areolar nipple suction. The *intrapersonal thoughts* subscale includes questions about the desire to breastfeed, internal motivation for breastfeeding, satisfaction with the experience of breastfeeding, and recognising signs of when the child is full.[6] It uses a Likert-type scale, for each question scores from 1 (totally disagree) to 5 (totally agree), with scores ranging from 14 to 70 points. BSES final score is characterised

as low efficacy when the score ranges between 14 to 32 points, medium efficacy from 33 to 51 points, and high efficacy from 52 to 70 points.[6]

During this first contact, the researcher informed the participants that they would be followed by mobile phone contact in the first and third months after hospital discharge. A home visit was scheduled by the researcher for the sixth month.

Phase II

Quantitative and qualitative data was collected through home visits from December 2017 to May 2018, six months after phase I. After hospital discharge, effective contact was maintained with 128 breastfeeding mothers'; 18.9% of the sample attrition was due to a change of address, no longer wanting to participate the baby being given up for adoption, or the baby's death after hospital discharge. Participants with whom effective contact was maintained answered the BSES-SF.

From the 128 participants in phase II, 22 participants were randomly sampled selected for qualitative study. To ensure diverse representation among the sample, mothers were first categorised by the five geographic city regions then random sampling was conducted from each category. Selected participants were then invited to participate in in-depth interviews.

The in-depth interview was conducted during the home visit, in a private setting within the breastfeeding mother's home, where she was accompanied only by the baby and the interviewer. Interviews typically lasted between 20 to 30 minutes. The content of the interviews was about the mother's perception of their confidence in breastfeeding their babies. Thus, the interviews were audio-recorded on the main research mobile device, the individual files were uploaded to the individual Dropbox cloud from the main research with a personal key to access. The data are not in public repositories with free access and will be kept for 10 years, after that will be destroyed.

The interviews were guided by the triggering question: "Tell me how your experience with breastfeeding has been until this moment?" followed by an interview script. The interview scripting included the following questions: "How do you perceive your ability to breastfeed your child?" (objective: identify maternal confidence for this purpose); "Describe what it has been like for you to breastfeed your child since leaving the maternity ward?" (objective: recognising the difficulties in the breastfeeding process); "Who are the people providing support and assistance to you while you need to breastfeed your child?" (objective: identifying the support received by the mother). Data collection continued until it represented a set of information for a theoretical construct to answer the objectives, following the theoretical saturation.

The development of the study can be seen in Figure 1.

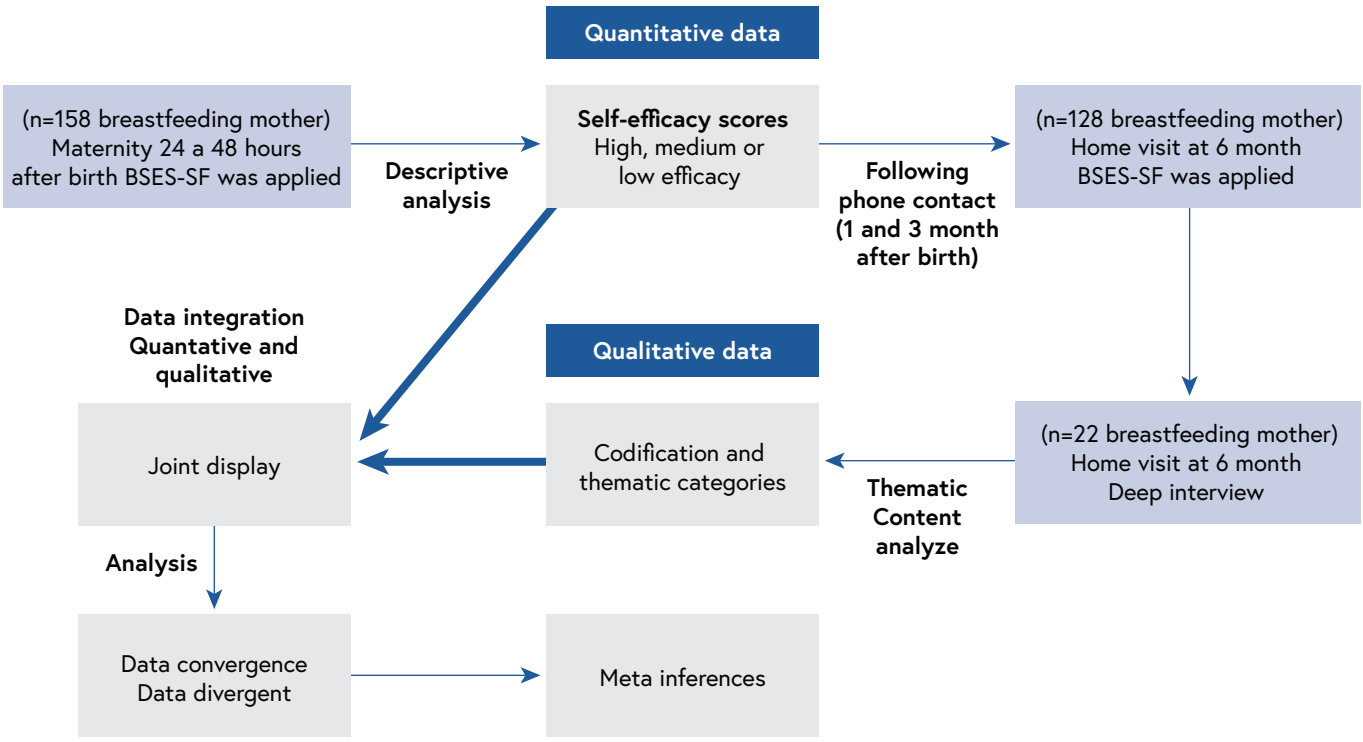

FIGURE 1: DATA COLLECTION PROCEDURES

DATA ANALYSIS

Quantitative data were statistically analysed by the XL Stat program (2010), and qualitative data were submitted for thematic content analysis.[10]

The quantitative analysis established the incidence and/or prevalence of breastfeeding and the relative risk between the groups in the immediate postpartum period and after six months, in this period the breastfeeding mothers were divided into two groups: 1. EBF, and 2. not exclusively breastfeeding. The internal consistency of the BSES-SF scale items was evaluated using Cronbach's Alpha Coefficient, considering high consistency when alpha levels ranged between 0.70 and 0.95, assuming a significance level of 5%. The scale items associated with the EBF duration were also identified by logistic regression (Hosmer and Lemeshow model). The Mann-Whitney-U test was used to analyse whether there was a difference between the BSES-SF scores in the mediate postpartum period and the sixth month of the postpartum period.

Content analysis in the thematic modality enabled identifying aspects that expressed the mother's self-confidence with breastfeeding their babies at home. After transcribing the interviews made by two researchers; one transcribed the interview, and the other checked the transcription. The participant was invited to review, confirm, or clarify the data or even obtain new information where it was not clear. The validation of the interview was carried out with all participants; two researchers manually and independently coded the categories, for later confrontation. After coding, the categories were compared to each other and then grouped into themes, seeking to establish conceptual relationships.[11]

Data integration occurred from the research problem question and the presentation of results and data analysis when the data set of each approach was integrated. For qualitative and quantitative data presentation, a joint display with thematic categories was elaborated according to the score obtained in the BSES-SF of the 22 participants of the qualitative stage. Each data set is presented separately, and a joint display describes the integration and interpretation of qualitative and quantitative data.

ETHICAL CONSIDERATIONS

The development of the investigation respected all Ethical precepts of Research with Human Beings, and the project was approved by the Ethics and Research Committee of the Western Paraná State University (reference number: 2.195.270).

RESULTS

PARTICIPANTS CHARACTERISTIC

Breastfeeding mothers were characterised by age, education, type of delivery, and duration of EBF. Participants have similar characteristics in terms of age, ranging from 18 to 24 years old, with most of them completing eight years or more of schooling, and had a vaginal birth. Most participants in the immediate postpartum period were classified with high breastfeeding efficacy according to the BSES-SF. However, the frequency of EBF was different between the initial period and the 6th month after delivery. In the initial period at the maternity, 80% of the total sample (N=128) were EBF. In the 6th month, among the 128 breastfeeding mothers participating in the second phase of the study, only 45.31% were EBF. In the group from the qualitative phase (n=22) 80% were EBF at maternity and 50% kept EBF until the sixth month. The relative risk of weaning at each stage was 0.2 at birth, and at the 6th month after birth was 0.3 in the total sample (n=128), while the selected participants in the qualitative interview had 0.5 (n=22).

BSES-SF quantitative data

Internal consistency of the BSES-SF, Brazilian version ranged from 0.942 to 0.951 between the scale's items and 0.9481 of the scale. Items on the scale associated with the duration of EBF were analysed (Table 1).

TABLE 1. BSES-SF QUESTIONS AND BREASTFEEDING DURATION AT SIXTH MONTH AFTER BIRTH. CASCAVEL-PARANA, BRAZIL, 2019 (N=128)

Source	Value	p-value	OR [IC95%]
Intercept	-4.823	0.006	
Q3			
1	0,000		
2	-0.755	0.641	0.470 [0.020 – 11.180]
3	1.216	0.121	3.372 [0.727 – 15.648]
4	2.573	0.038	13.110 [1.156 – 148.728]
5	3.618	< 0.0001	37.250 [9.678 – 143.387]
Q11			
1	0.000		
2	0.114	0.969	1.120 [0.004 – 324.360]
3	2.188	0.245	8.920 [0.222 – 358.215]
4	2.969	0.139	19.481 [0.382 – 994.249]
5	3.100	0.077	22.195 [0.714 – 689.995]

Statistic test:
Hosmer & Lemeshow Model (Chi-Square=1.374; GL=5; p=0.927).

Legend: 1 – not at all confident, 2 – disagree, 3 – sometimes agree, 4 – agree, 5 – completely agree.

Questions Q3 and Q11 were considered statistically significant in relation to EBF in the sixth month. These questions were the most likely to identify whether breastfeeding mothers will maintain EBF (Chi-square= 1.374; GL=5; p= 0.927). According to the logistic regression model, as detailed in Q3 (with the formula as a supplement), the mothers' responses that showed a statistically significant relationship with the duration of breastfeeding were 4 (agree) and 5 (strongly agree). Thus, the probability of EBF until the sixth month for breastfeeding mothers who answered, 'I agree' to Q3 ('there is no need to introduce formula as a supplement') is 13.11 times greater than those who answered, 'I totally disagree'. For those who answered, 'I totally agree', the probability of maintaining EBF was 37.25 times higher (Table 1).

For Q11 (breastfeeding technical subscale and breastfeeding in both breasts at the same feeding) none of the answers was statistically significant. Although not statistically significant, the response 'I totally agree' indicated that breastfeeding mothers were 22.19 times more likely to maintain exclusive breastfeeding until the sixth month compared to those who answered 'I totally disagree (p=0.077) (Table 1).

Comparing the BSES-SF final score in the 6th month, a statistically significant (p<0.5) difference was identified between the final self-efficacy scores. The mothers who exclusively breastfed had a higher median final score (Md=66.00) compared to those who did not exclusively breastfeed (Md=55.00), suggesting that EBF resulted in greater confidence.

QUALITATIVE DATA RESULTS

The qualitative analysis highlighted the importance of giving voice to breastfeeding mothers to express their breastfeeding experience. After the qualitative data processing, the following thematic categories were obtained:

- Mother breastfeeding perception act, which encompasses the subcategory *feelings towards breastfeeding.*
- Mother breastfeeding confidence perception, including the subcategories: *difficulties with breastfeeding* and *support for women during breastfeeding.*
- Breastfeeding experiences from hospital discharge to the sixth month of infant life with the subcategories: *back to work* and *reasons that led to the introduction of the formula.*

In each identified thematic category, the statements of the breastfeeding mothers are shown according to the scores obtained in the BSES-SF, namely, low efficacy, medium efficacy, and high efficacy, as observed in the joint display (Table 2).

MIXED METHOD APPROACH RESULTS

Among participants with a low score of the BSES-SF, the discontinuation of breastfeeding was linked to the child's behaviour, interpreted as dissatisfaction with breastfeeding, despite the desire to breastfeed. Those with medium efficacy reported interest in breastfeeding, as this act represents the possibility of establishing a bond with the child. When breastfeeding in public places, participants mentioned feeling embarrassed. This feeling could be a reason for choosing to feed supplementary formula or to give up breastfeeding altogether. Highly efficacy breastfeeding mothers commented about the benefits of breastfeeding for the child and the importance of nurturing the child wherever and whenever there was a demand.

Feeling confident influenced the mothers' empowerment for breastfeeding, evident in their ability to breastfeed their child, which converged with the high efficacy scores. The positive thinking towards breastfeeding shows that breastfeeding mothers feel essential in this process, as they can take care of their child.

The breastfeeding mothers with a low score on the BSES-SF reported that they received guidance and help at the hospital, but they lacked the support network at home. Consequently, they introduced formula because they felt their milk did not adequately feed the child. Breastfeeding mothers with medium and high efficacy reported support from professionals in the maternity ward, contributing to their breastfeeding autonomy at home. The family support network was important for this care at home, helping to increase the confidence to breastfeed.

Reasons to introduce formula feeding to infants of breastfeeding mothers with low efficacy included family influence and the belief that breast milk was not enough. Those with medium effectiveness returning to work decreased milk production and reported fear of breastfeeding in public. Breastfeeding mothers with high efficacy introduced formula due to medical indications and the impression that breast milk was not satisfying the child. In addition, return to work constitutes a hindering inhibiting factor for maintaining EBF, in which the breastfeeding mother is unaware of how to manage returning to work and maintaining breastfeeding.

Question Q3 of the BSES-SF demonstrated that breastfeeding mothers who planned to use formula milk as a complement were more likely to wean early. This information converges with breastfeeding mothers' responses during the deep interview, who reported using formula early, which corroborates the fact that only 50% of respondents breastfed exclusively in the first six months of the infant's life.

TABLE 2. JOINT DISPLAY TO PRESENT THE BREASTFEEDING MOTHER'S PERCEPTIONS OF BREASTFEEDING SELF-EFFICACY CLASSIFIED BY THE BSES-SF SCORES. CASCAVEL-PARANA, BRAZIL, 2019 (N=22)

	LOW EFFICACY (14–32 points)	AVERAGE EFFICACY (33–51 points)	HIGH EFFICACY (52–70 points)
Mother breastfeeding perception act			
Feelings towards breastfeeding	The time I breastfeeding was good, I liked to breastfeed (...) because of me I would have continued breastfeeding, but He was just complaining all the time, it seemed that my milk was not sustaining him (I11).	I've always wanted to breastfeed, when the baby breastfeeds, I feel it closer, more mine (I4). I find it interesting, but I don't feel comfortable to breastfeed (in public) ... it depends on the person I'm ashamed of (I124).	For God, He doesn't know what flu is, and I advise other mothers to breastfeed too, it's a good return we have due to their health (I24). It's a pleasure for you to feed the child, because I don't know, it's something like that for you, you're taking care of Him (I85). Breastfeeding for me is an act of love, it's an exchange of love between me and my daughter, the fact that every time we go to breastfeed, she looks at me and we look at each other, so it's an exchange of affection between me and her, so for me, breastfeeding is very important (E146).
Mother breastfeeding confidence perception			
Difficulties with breastfeeding	I had a lot of pain in my breast, it was a terrible time for me … and I gave up breastfeeding … (I11).	The first week was very painful ... at the beginning, he vomited a lot, it came out of his nose a lot, even there in the hospital… (I4).	I really suffered during the first few days, but because we didn't know how to breastfeed, because even with the injured breast, I breastfed well, to see how important it is (I30). From the beginning my nipple was inside, even making the pout for her to breastfeed was difficult, it cracked when I was in the hospital, but when I left the hospital and came home it was easier, because I was managing the situation (I38).
Support for women during breastfeeding	At the hospital I was able to breastfeed … Then, at home, he sucked even five or ten minutes and started to cry… my mother said I was low on milk, so I started giving the formula and he didn't cry anymore (I11)	In the first days I received a lot of help from my mother, my father, my husband, my sister helped me too (I4). At the hospital the nurses helped me, but at home I managed alone, I breastfed myself (I124).	My husband proved to be a partner, at the beginning when I sat down to breastfeed, I felt very thirsty, then he already came with the bottle of water to give me, he helped me with everything, when I went to take a shower, he took care of the baby and cut the vegetables to make my soup (I89). So, when I left the hospital, they gave me guidance, when I got home my mother-in-law was with me (I122)
Breastfeeding experiences from hospital discharge to the sixth month of infant life			
Back to work		Actually, I didn't even want to go back to work, but... I went back to work he was already 5 months old. Breastfeeding during this period was very complicated, because I only breastfeed early in the morning and after six o'clock in the afternoon (E4).	When she was three months old, I had to go back to work, and I tried to give her a bottle, she didn't take it at all, so I pumped the milk and let it be given to her because she didn't even want to know about a bottle, of course, she liked the mother's milk more. But then after a while I stopped working to dedicate myself to her (E10)
Reasons that led to the introduction of the formula	Ah, it was more by influence (introducing formula), because I would have continued breastfeeding, but I was breastfeeding and soon he would start crying (E11).	After I went back to work, he was on the chest a lot… I just cried and I realised that my chest was very empty, then the other day, I told my mother I was going to buy some milk (E4) I don't want to breastfeed anymore because I'm ashamed to breastfeed in public (E124)	When she was five months old, I started giving her formula, because she suckled and it was not easy, and she complained (E95). At three months or so, the doctor thought she was not at the ideal weight and ordered a supplement, so I supplemented two to three times, but I never stopped breastfeeding (E44).

DISCUSSION

The association of the mother's breastfeeding self-efficacy with infant feeding in the first six months of the child's life was identified based on the statistical significance and logistic regression about the duration of EBF and the BSES-SF scores. It was observed that breastfeeding mothers with high efficacy for breastfeeding had a positive perception of their confidence for breastfeeding and breastfed exclusively until the infant was six months of age. In addition, it was demonstrated that the intention to use formula as a possibility to feed the child and the mother's lack of knowledge regarding the need to breastfeed from both breasts at each feeding were markers for early weaning. Another relevant point identified was the importance of support for breastfeeding continuation. In this sense, mothers who presented medium and higher self-efficacy

scores mentioned in their responses good family or professional support to stimulate or help them to breastfeed their child. Many women, however, do not breastfeed or stop soon after childbirth, often due to a lack of support.[18]

Qualitative and quantitative data showed that the introduction of formula was an aspect that converged between the Q3 of the BSES-SF and the breastfeeding mothers' statements. In this question, mothers who are at risk of introducing formula early are identified and the reasons for this behaviour were evident in the interview. Among these reasons, mothers cite in their responses the need to return to work, the perception that their milk supply was insufficient, the absence of support from their spouse or family, the infant's difficulty in latching to breastfeed, and the paediatrician's recommendation due to the baby's poor weight gain or gastroesophageal reflux. The prevalence of EBF is positively associated with higher breastfeeding self-efficacy, mothers' level of education, and early initiation of breastfeeding, while preterm birth and preparation for infant formula before delivery were barriers to EBF.[18]

In the quantitative approach of this study, from the model created by logistic regression aiming to find the associated factors between the BSES-SF questions and the duration of breastfeeding, the probabilities can predict approximately 95.7% of the factors associated (Q3 and Q11) with the outcome (EBF at six months of age). The sensitivity of the adjusted model reflects its effectiveness in identifying mothers who could exclusively breastfeed until six months, which in this proposal is equivalent to 85.71%. Its specificity reflects how effectively it can correctly identify those who would not breastfeed until six months, which in this study is equivalent to 88.24%. In other words, the model can very effectively identify the association between women who will breastfeed and those who will not breastfeed until the infant is six months old.[19]

Another factor that influences the duration of breastfeeding is returning to work, as noted by the participants. Full-time employment for Ethiopian mothers was found to have a negative correlation with EBF compared to those who are unemployed. [20] Therefore, it is imperative to enact policies that empower women. Additionally, both government and non-government organisations should strive to establish supportive environments in the workplace for mothers to practice EBF.[20]

The mother's confidence in her ability to breastfeed can be studied within the construct of self-efficacy, where a woman must believe she is capable of successfully performing certain tasks or behaviours to achieve desirable outcomes.[5,6] In the immediate postpartum period, the BSES assessment revealed that women with moderate to high levels of self-efficacy were more likely to continue EBF. Consequently, the positive perception of maternal confidence reflects their breastfeeding capability and can inform targeted interventions aimed at promoting and sustaining EBF.[21]

Thus, difficulties in handling breastfeeding, such as maternal beliefs, family culture, and lack of support from the partner and family are aspects that impair EBF.[22] In this study, breastfeeding mothers reported the association of breastfeeding with feelings of pleasure, as an act of love, and satisfaction because the mothers might contribute to the child's health. They also recognised the benefits of breastfeeding and the excellent bond between both mothers and babies. A similar perception was evidenced in other studies in the literature, showing that, independent of culture, lifestyle, and country uses are similarly related to breastfeeding.[7,23]

Participants reported difficulties with breastfeeding, which were associated with factors such as challenges in the breastfeeding process, lack of knowledge, insecurity, and inadequate latch causing nipple pain. These perceptions, appear to be consistent regardless of the participants' place of residence and reflect a recurring pattern in breastfeeding experiences, as evidenced in the literature.[15] These occurrences represent a risk factor for self-efficacy, which demonstrates the importance of health professionals in providing anticipated guidance, supporting the mothers, and encouraging them to continue in the breastfeeding process.[7] Thus, the support offered to mothers in the breastfeeding process, whether by their partner, family members, or health professionals, is essential for them to feel comfortable in EBF until the sixth month and be able to solve any difficulties breastfeeding, should they appear.[24] Participants referred to the support given by professionals during their maternity stay but, they did not mention the support of the health team in the prenatal period or after hospital discharge.

Our study identified some domains of support that could be offered to breastfeeding mothers during the prenatal period, such as, providing information about the benefits of EBF, proper breastfeeding techniques, and how to overcome common challenges, this can significantly support their breastfeeding journey; offering emotional support through counselling, peer support groups, and access to lactation consultants can help mothers navigate the emotional aspects of breastfeeding, such as feelings of doubt, frustration, or anxiety; assisting mothers with practical aspects like childcare, household chores, and meal preparation can alleviate their burden, allowing them more time and energy to focus on breastfeeding; ensuring mothers have access to essential resources such as breast pumps, breastfeeding-friendly workplaces, and breastfeeding-friendly public spaces can facilitate their ability to breastfeed exclusively, especially after returning to work or when outside the home; encouraging partners and family members to actively support breastfeeding mothers by understanding their needs, offering encouragement, and actively participating in caregiving responsibilities can create a supportive environment conducive to EBF and building a supportive community network that promotes breastfeeding, including local support groups, online forums, and community

events, can provide mothers with a sense of belonging and encouragement throughout their breastfeeding journey.

In addition, the prenatal period is considered the golden time to prepare the future breastfeeding mother for breastfeeding. Applying the BSES-SF before leaving the maternity ward can identify those who need more targeted follow-up, especially when mothers exhibit low efficacy and their responses to Q3 and Q11 of the scale demonstrate a higher risk of early weaning.

Follow-up over the first six months of the child's life can identify difficulties that arise in the BF breastfeeding process over time and, thus, enable the healthcare provider to conduct direct actions to promote EBF duration. The nurse should initiate an individual assessment to evaluate the mother's unique breastfeeding requirements and obstacles. This assessment may involve identifying problems related to positioning and latch, milk supply, emotional well-being, or any other challenges she may encounter. Monitoring breastfeeding mothers in the puerperium period is essential to avoid weaning; this is a maternal fragility period, which requires social and family support to maintain breastfeeding. Social support was also presented as a positive factor associated with mother's high levels of breastfeeding efficacy in other studies.[25,26]

The high score on the BSES-SF is a protective factor for EBF.[12] In our research, breastfeeding mothers with the highest score on the BSES-SF were the most favourable to maintaining EBF for at least six, a fact also observed in other studies.[13,14]

Confidence in the ability to successfully breastfeed results from maternal self-efficacy, which permeates health behaviours. Efficacy beliefs can be developed from direct, vicarious experience, social persuasion, and physical and emotional state.[5] Therefore, previous successful experiences, good practices experiences, empowerment about breastfeeding benefits, and the pleasure that breastfeeding provides, are factors that influence breastfeeding success. These elements were presented by the breastfeeding mothers with the highest score in the BSES-SF in our study.

Despite the high efficacy scores, the prevalence of EBF at six months was low, demonstrating that the management of breastfeeding at home represents many difficulties that lead to early weaning. Therefore, high mother's confidence to provide breastfeeding at discharge from a hospital stay does not mean she will maintain EBF; a factor that was proven when comparing the qualitative data to the BSES-SF scores at six months after birth. It is evident that extrinsic factors to early weaning are primiparity, lack of family support, caesarean delivery, difficulties with breastfeeding, insufficient milk supply and return to work,[7,15,16] and signs of depression and maternal stress.[17] In our study, these factors were also identified, except depression and stress aspects. Our results also showed that all these factors are significantly associated with early weaning; however, we did not assess depression and stress in this sample.

The data from the BSES-SF among the breastfeeding mothers who participated in the deep-interview showed aspects that are not identified in the scale, such as feelings reported towards the act of breastfeeding or the difficulties in handling breastfeeding. Thus, the BSES-SF scores need to be considered to promote the EBF associated with the breastfeeding mother's social, family, cultural, and economic aspects. So, using this information requires studies based on the analysis of a phenomenon, as well as quantitative, and qualitative data. Mothers with a BSES-SF score below 58 points in primary health care are at risk of early withdrawal of EBF, within the first two months.[27] Therefore, identifying self-efficacy scores for breastfeeding, associated with qualitative discourses of mothers obtained during interviews during the postpartum consultation in primary health care, are essential elements for nurses to recognise mothers at risk of early weaning and enable effective interventions to promote the maintenance of EBF until the infant's sixth month of life.

BSES-SF demonstrated high efficacy for breastfeeding among the breastfeeding mothers in the study, showing an association between higher scores and longer duration of EBF. Self-efficacy appears to be a significant predictor of EBF. Therefore, EBF could be enhanced by safe education during pregnancy, reinforcing pregnant women's self-efficacy and considering their personality traits.[28] It is noteworthy that using the BSES-SF as a facilitating tool to identify the self-confidence of breastfeeding mothers in breastfeeding associated with comprehensive and individualised care for them will enable a broader approach to managing breastfeeding by health professionals. Therefore, encouraging maternal self-efficacy and empowerment helps to develop confidence in her ability to breastfeed. In addition, the BSES-SF results can be used to recognise the efficacy of different kind of interventions offered in the health services to support breastfeeding among pregnant women and breastfeeding mothers.[6]

Despite the many reports that maternal self-efficacy is a factor that can influence the duration of EBF, in our study we present as new knowledge, the establishment of the relationship between specific issues of BSES-SF (breastfeeding from both breasts and intention not to use formula) as predictive for the duration of EBF. In addition, another innovative aspect was the integration of qualitative-quantitative approaches, in which the convergence of self-efficacy scores and the perception of breastfeeding mothers about their confidence and intention to maintain EBF were observed.

LIMITATIONS

This study had limitations, such as bias in the sample selection and lost follow-up in the quantitative stage, the non-probabilistic sampling, and the lack of identification of all mechanisms that may explain how the independent variables influenced the dependent variable, which was not evaluated in the study. Further research is suggested in this context and with this methodology, as this research model with mixed methods allowed distinct associations between qualitative and quantitative data, contributing to the production of results that complement each other.

CONCLUSION

The design of mixed methods studies to analyse the breastfeeding phenomenon, which identified self-efficacy, and self-perception of knowledge associated with the experience of early breastfeeding problems, evidenced a theoretical construct encompassing different views of the same phenomenon.

Considering an early identification of mothers with low self-efficacy allows assessment nurses to start preparing the breastfeeding mothers to avoid difficulties related to the breastfeeding technique and give the necessary time to investigate other risk factors for early weaning.

IMPLICATIONS FOR PRACTICE

Applying the Breastfeeding Self Efficacy Scale associated with the breastfeeding mothers' interview from the prenatal period enables the identification of risks for early weaning and helps health providers in planning care for mothers and babies in favour of breastfeeding maintenance.

Declaration of conflicting interests: None.

Acknowledgments: This study is part of an international multicentric project with the University of Kentucky-USA entitled Exclusive Maternal Breastfeeding: Determinants socio and cultural in Latin América. In Brazil, the project was called EBF: Sociocultural Determinants in Brazil, the local coordination is at UFRJ. The manuscript now submitted refers to data from the center in Paraná, specifically at Cascavel city.

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RESEARCH ARTICLES

Psychological distress in registered nurses and the role of the workplace: A cross-sectional study

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ABSTRACT

Objective: To investigate the impact of workplace factors on psychological distress in New Zealand registered nurses.

Background: Nurses are often faced with challenging work environments, with long work hours, high patient ratios, and emotionally charged situations that cause stress. Despite the well-established links between the nurse work environment and well-being, there remains a gap in the literature around the role of workplace factors on psychological distress in nurses.

Study design and methods: A cross-sectional survey was conducted with registered nurses in New Zealand. Depression, anxiety, and stress were self-reported using the DASS-21, while difficult practice environments and negative workplace acts were self-reported using PES-NWI and NAQ-R. Descriptive and inferential statistics were undertaken using SPSS. STROBE guidelines were used to report the study.

Results: 480 RNs completed the survey. On average, depression, anxiety, and stress scores were 6.08 (SD=7.06, Normal), 4.87 (SD=6.05, Normal), and 9.50 (SD=7.30, Normal), respectively. The Average PES-NWI score was 2.70 (SD=0.54), while the average total NAQ-R score was 34.27 (SD=12.67). Depression, anxiety, and stress scores were positively associated with NAQ-R scores, and negatively associated with PES-NWI scores (p-values <0.05). PES-NWI score was negatively associated with NAQ-R score (p<0.05). PES-NWI and NAQ-R explained 28.8%, 15.6%, and 26.1% of the variation in depression, anxiety, and stress, respectively. Depression, anxiety, and stress were significantly associated with intention to leave (p-values <0.05). Depression and anxiety were significantly associated with ethnicity (p-values <0.05). Age was negatively associated with anxiety and stress (p-values <0.05). Years employed as a nurse were also negatively associated with anxiety (p<0.05).

Discussion: This study addresses a knowledge gap by demonstrating that workplace factors are associated with psychological distress in nurses.

Conclusion: Psychological distress in nurses is significantly associated with the work environment and with intention to leave the profession. Given that most countries are facing nurse shortages and

 https://doi.org/10.37464/2024.413.980

are actively recruiting nurses from diverse countries and ethnic backgrounds, targeted and individualised support needs to be provided to preserve nurses' mental health and subsequent retention in the workforce.

Implications for research, policy, and practice: Healthcare providers must prioritise modifying the work environment to address the factors contributing to nurses' psychological distress. This includes providing culturally tailored mental health resources and support for nurses with diverse backgrounds and experiences. Future research should examine how organisational-level strategies can reduce psychological distress in nurses.

What is already known about the topic?
- Psychological distress is common in nurses.
- Indicators of psychological distress include non-specific symptoms of stress, anxiety, and depression.
- Psychological distress is associated with challenging working conditions.

What this paper adds:
- Vulnerable groups, such as nurses from specific ethnic backgrounds and less experience, report higher levels of psychological distress, such as anxiety and depression.
- The quality of the practice environment is associated with psychological distress in registered nurses.
- Negative acts in the workplace (i.e., bullying and harassment) are positively associated with psychological distress in registered nurses.

Keywords: bullying; nursing; psychological distress; survey; workplace

BACKGROUND

Nurses can experience psychological distress when faced with challenging work conditions.[1,2] Psychological distress is the physical and emotional discomfort nurses experience due to job demands. It can include symptoms of depression, anxiety, and stress.[3,4] An Australian study examining the prevalence of depression, anxiety, and stress (proxy indicators of psychological distress) in a group of Australian nurses working in various settings found that prevalence rates of depression, anxiety, and stress, when using clinical cutoff scores, were 32.4%, 41.2%, and 41.2%, respectively.[1] Psychological distress can lead to individual suffering, including reduced job satisfaction, impaired quality of life, and increased alcohol consumption.[5-7] Additionally, psychological distress in nurses can result in adverse clinical outcomes that risk patient safety and quality delivery of care. Other workplace outcomes may include increased absenteeism and turnover.[8-10]

Challenging work conditions faced by nurses include excessive workloads, unsupportive management, shift work, understaffing, bullying, harassment, abuse, workplace discrimination, interpersonal conflict, and lack of professional support or mentorship.[9-12] Several studies have highlighted the association between workplace factors and psychological distress in RNs.[13-16] A study on US hospital nurses found that both occupational and non-occupational factors predict psychological distress in nurses. Occupational factors included unit tenure (length of time the nurse has worked in the unit), professional experience, position level, job/nonjob conflict (impact of work on non-work activities), and relations with the head nurse, coworkers, physicians, and other units/departments. Non-occupational factors included personal disposition and social integration.[13] A longitudinal study with Scottish nurses (N=147) and nursing students (N=212) found that stress, life events, and level of self-esteem were associated with psychological distress. In addition, higher levels of psychological distress were reported in newly qualified nurses beginning their careers.[14] A study involving nurses in Iran found psychological distress was associated with gender, marital status, employment status, age, work history, shift work, and ward type.[15] Psychological distress was higher in single female nurses and nurses on 'trial' employment contracts.[15] Similarly, a Portuguese study identified that psychological distress was associated with being female, absence of physical exercise, lack of hobbies, and primary health work location.[16] These findings demonstrate that nursing-related psychological distress is a global issue, highlighting the urgent need for comprehensive strategies to promote healthier workplaces.

Several studies have explored depression, anxiety, and stress in nursing populations as a proxy for psychological distress.[17,18] To assess these conditions, researchers often use the Depression, Anxiety and Stress Scale, which measures non-specific symptoms of stress, anxiety, and depression.[19] A study exploring the psychosocial impact of the COVID-19 pandemic on Australian nurses and midwives found that about a fifth of nurses and midwives reported moderate to extremely severe symptoms of depression, anxiety, and stress. A study of nurses from Queensland (Australia) found depression, anxiety, and stress were negatively associated with compassion satisfaction and resilience and positively associated with burnout and secondary traumatic stress.[20]

Another Australian study of mental health nurses found that depression, anxiety, and stress were negatively associated with resilience and psychological well-being.[21]

Efforts to address psychological distress or burnout in nurses have mainly focused on the individual.[22,23] Interventions have included resilience training,[24] mindfulness training,[25] and stress management training.[26] Although fewer studies have investigated organisational-level interventions, research indicates that addressing the causes of unhealthy work environments can improve nurse and patient outcomes.[27,28]

Two lines of inquiry have been instrumental in our understanding of how workplaces affect nurse outcomes: 1) The International Hospital Outcomes Study (IHOS) and 2) The Bergen Bullying Research Group's (BBRG) work on bullying and harassment in the workplace.[29,30] The IHOS reflects a wealth of international research that provides reliable and generalisable evidence demonstrating that staffing levels and the quality of the practice environment are linked to nurse, patient, and hospital outcomes.[28,31] The BBRG has gathered data from over 60 studies and more than 40,000 respondents from around 40 countries. The information is stored in the International Database on the Prevalence and risk factors of Bullying at work (IDPB). The findings from this research showed that employees exposed to negative acts in the workplace, including bullying, harassment and threats of violence, reported various adverse mental and physical health outcomes.[11] The IHOS and BBRG provide valuable frameworks for examining workplace factors contributing to registered nurses' psychological distress.

Given the critical role nurses play in our healthcare system, efforts to improve work environments for nurses should be a priority for all health services, particularly given the global nursing shortage.[32] However, in New Zealand, research in this area is lacking. Therefore, this study aimed to investigate the impact of workplace factors on psychological distress in NZ RNs.

OBJECTIVE

To investigate the impact of workplace factors on psychological distress in NZ RNs.

STUDY DESIGN AND METHODS

DESIGN

A cross-sectional survey design was used to identify associations between workplace factors (practice environment and negative acts in the workplace) and psychological distress (depression, anxiety, and stress).

STUDY POPULATION, SETTING, AND SAMPLE

New Zealand, a developed nation, has 74,439 practising (having a current annual practising certificate) RNs on the Register maintained by the Nursing Council of New Zealand (NCNZ) in December 2023. Nearly 43% of RNs were internationally qualified.[33] Approximately 91% were female; 41% were 50 years or older; 50% had practised for 15 or more years, and 7.6% identified as Māori, NZ's Indigenous population. Over 60% of all NZ RNs were employed in one of the 20 District Health Boards.[34] A convenience sample of RNs who were members of the New Zealand Nurses Organisation (NZNO) were invited (approximately 40,700 in 2018) to participate in this study.

DATA COLLECTION

Data was collected in under three months, between 23 August and 4 November 2018. Five thousand RNs were randomly selected from the NZNO database and invited to participate by email. The NZNO population has a demographic profile similar to the national NZ nursing population. The email invitation included information about the study, research team contact details, and a SurveyMonkey™ link to the anonymous online survey. A participant information sheet was provided at the beginning of the survey, which conformed to ethical procedures. Informed consent was provided by participants endorsing an electronic consent statement. Three reminders were sent at weeks two, four, and six. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for cross-sectional studies was used for this paper to ensure clear and complete reporting of study conduct.[35]

ETHICS AND CULTURAL CONSIDERATIONS

Ethical approval was obtained from the Central Queensland University Human Research Ethics Committee (CQU HREC) (approval number 2110). Study approval was also obtained from NZNO (1 May 2018). Māori (Indigenous) consultation was undertaken through the University of Otago.

VARIABLES AND MEASUREMENTS

Demographic Characteristics

Demographic and job-related characteristics self-reported by the participants included age, gender (male, female, other), ethnicity (European, Non-European), relationship status (single, in a relationship, defacto/married/cohabitating, other), employment status (full-time, part-time, other), highest nursing qualification (undergraduate, postgraduate, other), years employed as a nurse, place of employment (DHB, non-DHB), and intention to leave in the last 12 months (yes, no).

 https://doi.org/10.37464/2024.413.980

Validated Surveys

Psychological distress was measured using the 21-item Depression, Anxiety, and Stress Scale (DASS).[36] The DASS is a self-report four-point severity scale that measures negative emotional states of depression, anxiety, and stress over the last week. The DASS-21 has been shown to have high internal consistency, producing coefficient alpha values of 0.88, 0.82, and 0.90 for the depression, anxiety, and stress subscales, respectively.[37] A study using a UK non-clinical sample found a mean of 5.66 (SD= 7.74), 3.76 (SD= 5.90), and 9.46 (SD= 8.40) for the depression, anxiety, and stress scales, respectively.[37] Scores on the three subscales are calculated by summing the seven items within each scale and multiplying by 2. Scores on the three subscales range from 0 to 42. The recommended cut-off scores for conventional severity labels are presented in Table 1.

TABLE 1: DASS21 DEPRESSION, ANXIETY AND STRESS SEVERITY RATING AND CLINICAL CUT-OFF CORES (LOVIBOND & LOVIBOND, 1995)

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

The Practice Environment Scale of the Nursing Work Index (PES-NWI)[38] was used to assess the practice environment. The PES-NWI includes 31 items with five subscales with items scored on a Likert scale. The four responses are: 1 = strongly agree, 2 = somewhat agree, 3 = somewhat disagree, and 4 = strongly disagree. The five subscales are: 1) nurse participation in hospital affairs (nine items), 2) nurse foundations for quality of care (nine items), 3) nursing unit manager ability, leadership, and support of nurses (five items), 4) staffing and resource adequacy (four items), 5) collegial nurse–doctor relations (three items). The PES-NWI has been used in a revised form within the Australian context, with one item removed (item 31: "use of nursing diagnosis"), as Australian nurses do not diagnose patients.[39] This also applies in the NZ context. The revised version has been validated using a Queensland nursing population demonstrating good psychometric properties.[40] Response categories were reversed; 1 = strongly disagree, 2 = somewhat disagree, 3 = somewhat agree, and 4 = strongly agree. A composite (overall) score can be calculated by averaging the five summed subscale scores. The composite score was used in this study.

The Negative Acts Questionnaire-Revised (NAQ-R)[41] was used to assess perceived exposure to negative acts in the workplace. The NAQ-R, a 22-item self-report survey consisting of three subscales, measures the frequency, intensity, and prevalence of unwanted and negative behaviour and workplace bullying within the past six months. The three subscales are 1) person-related bullying (seven items), 2) work-related bullying (12 items), and 3) physically intimidating bullying (three items). Examples of unwanted behaviour include being exposed to persistent unjustified criticism, having information withheld that affects performance and being ordered to do work below the level of competence. Bullying behaviours included finger-pointing, being shouted out, being threatened, and having one's personal space invaded. The NAQ-R items assess a respondent's perception of exposure to unwanted and negative behaviour, which may be deemed bullying if occurring frequently over time (often referred to as the 'behavioural method'). The NAQ-R has five responses: 1 = never, 2 = now and then, 3 = monthly, 4 = weekly, and 5 = daily. Total NAQ-R scores (using the first 22 items) range from 22-110, with higher scores indicating heightened intensity. The NAQ-R has good psychometric properties.[42] The total NAQ-R score was used for this study.

DATA ANALYSIS

Analyses were conducted using SPSS, v27.0. Descriptive statistics were presented as mean (SD) for quantitative variables and frequencies and percentages for categorical ones. T-test and ANOVA were used to examine associations between psychological distress (depression, anxiety, and stress) and sample characteristics (categorical variables). Pearson's correlations were computed to test associations between psychological distress with age, years employed as a nurse, the five subscales of the PES-NWI, and three subscales of the NAQ-R. Multiple linear regression was used for multivariable analysis to determine the associations between workplace factors (i.e., practice environment and bullying) and psychological distress.

Two regression models were run. Model 1 included two workplace factors, i.e., average PES-NWI score and average NAQ-R score. Model 2 had the two workplace factors adjusted for age, gender, relationship status, ethnicity, years employed as a nurse, highest nursing qualification, and place of employment. Assumptions were checked and met. Regression coefficients and 95% confidence intervals were reported for workplace factors. To assess their internal consistency reliability, Cronbach's alphas were calculated for the DASS-D, DASS-A, DASS-S, PES-NWI, NAQ-R, and all subscales. Missing values were excluded from analyses. All p-values are two-sided and considered significant if <0.05.

RESULTS

A total of 479 participants completed all the survey scales, and the 'completed' response rate was 9.70% (479/4,939 after removing inactive emails). Items within the three subscales of the DASS were well correlated; Cronbach's alphas (α) were 0.87, 0.80, and 0.85 for depression, anxiety, and stress scales, respectively. The PES-NWI and NAQ-R showed good internal consistency, as reported previously.[43] Table 2 shows the demographic and job characteristics of the sample. The attributes of this sample are similar to those of the national sample. On average, depression, anxiety, and stress scores were 6.08 (SD=7.06), 4.87 (SD=6.05), and 9.50 (SD=7.30), respectively. The average PES-NWI score was 2.70 (SD=0.54), while the average total NAQ-R score was 34.27 (SD=12.67). The prevalence of normal, mild, moderate, severe, and extremely severe are shown in Table 3.

TABLE 2: PARTICIPANT CHARACTERISTICS (N = 479)

	n	% or mean (SD)
Gender		
Male/other	27	5.6%
Female	452	94.4%
Age (years)		
<50	231	48.2%
50 and over	248	51.8%
Average age (years)		47.5 (12.62)
Relationship Status		
Single/other	111	23.2%
In a relationship	51	10.6%
Married/defacto/cohabitating	317	66.2%
Ethnicity		
European	364	76.0%
Non-European	115	24.0%
Highest Nursing Qualification		
Undergraduate/other	365	76.2%
Postgraduate	114	23.8%
Employment Type		
Full-time	233	48.6%
Part-time/other	246	51.4%
Years Employed as a Nurse (years)		
0-15	185	38.6%
>15	294	61.4%
Average Years Employed as a Nurse		21.1 (13.67)

	n	% or mean (SD)
Place of Employment		
District Health Board	297	62.0%
Non-District Health Board	182	38.0%
Intention to Leave		
Yes	251	52.4 (%)
No	228	47.6 (%)
Other		
DASS-D score		6.08 (7.06)
DASS-A score		4.87 (6.05)
DASS-S score		9.50 (7.30)
PES-NWI composite score		2.71 (0.54)
Nurse Participation in Hospital Affairs sub-scale score		2.41(0.65)
Staffing and Resource Adequacy sub-scale score		2.43 (0.78)
Nurse Foundations of Quality Care sub-scale score		2.92 (0.53)
Collegial Nurse Doctor Relations sub-scale score		3.11 (0.68)
Nurse Manager, Leadership and Support of Nurses sub-scale score		2.70 (0.78)
NAQ-R total score		34.23 (12.66)
Person-related bullying sub-scale score		17.33 (7.04)
Work-related bullying sub-scale score		12.65 (5.30)
Physically intimidating bullying sub-scale score		4.25 (1.90)

DASS-D: Depression Anxiety Stress Scale – Depression; DASS-A: Depression Anxiety Stress Scale – Anxiety; DASS-S: Depression Anxiety Stress Scale - Stress PES-NWI: Practice Environment Scale-Nurse Work Index; NAQ-R: Negative Acts Questionnaire-Revised.

TABLE 3: DASS SEVERITY CATEGORY (N = 479)

	Depression n (%)	Anxiety n (%)	Stress n (%)
Normal	356 (74.3)	362 (75.6)	378 (78.9)
Mild	51 (10.6)	26 (5.4)	52 (10.9)
Moderate	48 (10.0)	55 (11.5)	33 (6.9)
Severe	15 (3.1)	16 (3.3)	13 (2.7)
Extremely Severe	9 (1.9)	20 (4.2)	3 (0.6)

 https://doi.org/10.37464/2024.413.980

Table 4 shows the Pearson's correlations between the three subscales of the DASS, PES NWI, and NAQ-R. Depression, anxiety, and stress scores were positively correlated with the NAQ-R score (r=0.52, r=0.39, and r=0.49, respectively; all p-values <0.001). Depression, anxiety, and stress subscale scores were negatively associated with PES-NWI score (r=-0.38, r=-0.27, and r=-0.39, respectively; all p-values <0.001). PES-NWI score was negatively correlated with the NAQ-R score (r=-0.50, p<0.001).

Table 5 shows bivariate associations between depression, anxiety, stress, and sample characteristics. Depression, anxiety, and stress were not significantly associated with gender, relationship status, highest nursing qualification, employment type, or place of employment (p-values>0.05). Depression, anxiety, and stress were significantly associated with the intention to leave; that is, respondents who had considered leaving nursing in the last 12 months had, on average, 3.12, 1.94, and 3.67 points more than others,

TABLE 4: PEARSON'S CORRELATIONS BETWEEN SCALES (N = 479)

	Mean	SD	1	2	3	4	5
DASS-D [1]	6.08	7.06	1				
DASS-A [2]	4.87	6.05	.64*	1			
DASS-S [3]	9.50	7.30	.73*	.72*	1		
PES-NWI Composite Score [4]	2.71	0.54	-.38*	-.27*	-.39*	1	
NAQ-R Score [5]	34.23	12.66	.52*	.39*	.49*	-.50*	1

DASS-D = DASS Depression; DASS-A = DASS Anxiety; DASS-S = DASS Stress; PES-NWI = Practice Environment Scale - Nurse Work Index; NAQ-R = Negative Acts Questionnaire - Revised

* Correlation is significant at the <0.001 level (2-tailed)

TABLE 5: BIVARIATE ASSOCIATIONS BETWEEN PSYCHOLOGICAL DISTRESS AND SAMPLE CHARACTERISTICS (N = 479)

	n	Depression Mean (SD)	Anxiety Mean (SD)	Stress Mean (SD)
Gender				
Male/other	27	6.81 (7.30)	5.78 (6.82)	8.44 (8.85)
Female	452	6.04 (7.05)	4.81 (6.00)	9.57 (7.21)
Relationship Status				
Single/other	111	6.97 (7.79)	4.92 (6.67)	9.71 (7.74)
In a relationship	51	5.96 (6.41)	6.12 (5.43)	9.76 (7.02)
Married/defacto/cohabitating	317	5.79 (6.88)	4.65 (5.91)	9.39 (7.21)
Ethnicity				
European	364	5.71 (6.82)*	4.52 (5.96)*	9.60 (7.32)
Non-European	115	7.25 (7.68)	5.97 (6.24)	9.20 (7.27)
Highest Nursing Qualification				
Undergraduate/other	365	6.25 (7.02)	5.06 (6.11)	9.70 (7.18)
Postgraduate	114	5.54 (7.20)	4.26 (5.85)	8.86 (7.68)
Employment Type				
Full time	233	6.27 (7.43)	5.04 (6.34)	9.25 (7.49)
Part-time/other	246	5.90 (6.69)	4.71 (5.77)	9.75 (7.13)
Place of Employment				
DHB	297	6.53 (7.48)	5.21 (6.25)	10.00 (7.63)
Non-DHB	182	5.35 (6.26)	4.31 (5.67)	8.69 (6.68)
Intention to Leave				
Yes	251	7.57 (7.87)***	5.79 (6.42)***	11.25 (7.67)***
No	228	4.45 (5.62)	3.85 (5.45)	7.58 (6.35)

*p<0.05 (2-tailed), **p<0.01 (2-tailed), ***p<0.001 (2-tailed)

respectively (p-values<0.001). Depression and anxiety were also significantly associated with ethnicity; that is, respondents who were non-European had, on average, 1.54 and 1.45 points more than others. Age was negatively correlated with anxiety (r=-.24, p<.001) and stress (r=-.12, p<.05). Years employed as a nurse were also negatively correlated with anxiety (r=-.23, p<.001). Age was not correlated with depression, while years employed as a nurse were not correlated with depression or stress.

Multivariable associations between depression, anxiety, and stress (indicators of psychological distress) and workplace factors (i.e., practice environment and negative acts in the workplace) are presented in Tables 6-8. Model 1, which included only two workplace factors, explained 28.8%, 15.6%, and 26.1% of the variation in depression, anxiety, and stress, respectively. Both factors were significantly associated with depression, anxiety, and stress. For every point increase in PES-NWI, there was a 2.11-point decrease in depression, a 1.09-point decrease in anxiety, and a 2.63-point decrease in stress, respectively (p-values<0.05). In contrast, for every point increase in NAQ-R, there was a 0.25-point increase in depression, 0.16-point increase in anxiety, and 0.22-point increase in stress (p-values<0.001). The results were similar even after controlling for age, gender, ethnicity, relationship status, years employed as a nurse, highest nursing qualification, and place of employment (Model 2 in Tables 6-8). Coefficients for depression, anxiety, stress, and PES-NWI were -1.99, -1.16, and -2.50, respectively (p-values<0.05). Coefficients for depression, anxiety, stress, and NAQ-R were 0.25, 0.16, and 0.24 respectively (p-values<0.001). Model 2 explained 30.2%, 20.4%, and 27.6% of the variation in depression, anxiety, and stress, respectively.

TABLE 6: MULTIPLE LINEAR REGRESSION COEFFICIENTS (95% CONFIDENCE INTERVAL) BETWEEN WORKPLACE FACTORS AND DEPRESSION (N = 479)

	Model 1	Model 2†
PES-NWI	–2.11 (–3.25, –0.98)***	–1.99 (–3.12, –0.85)***
NAQ-R	0.25 (0.20, 0.29)***	0.25 (0.20, 0.30)***
Age	–	0.05 (–0.02, 0.12)
Gender		
M/Other v. F	–	1.05 (–1.26, 3.36)
Ethnicity		
Euro v. non-Euro	–	–0.63 (–1.93, 0.66)
Relationship status		
Single/Other (v. M/D/C)	–	–0.27 (–1.55, 1.02)
In a relationship (v. M/D/C)	–	–1.14 (–3.00, 0.73)
Yrs. employed as a nurse	–	–0.07 (–0.14, –0.01)*
Highest nursing qual.		
UG/other v. PG	–	0.44 (–0.80, 1.69)
Place of employment		
DHB v. non-DHB	–	1.38 (0.26, 2.49)
Adjusted R^2	**0.288**	**0.302**

† Controlled for age, gender, ethnicity, relationship status, highest nursing qualification, years employed as a nurse, and workplace type.

PES-NWI = Practice Environment Scale - Nurse Work Index
NAQ-R = Negative Acts Questionnaire - Revised
M/D/C = Married, Defacto, Cohabitating
UG = Undergraduate, PG = Postgraduate

*p<0.05, **p<0.01, ***p<0.001

TABLE 7: MULTIPLE LINEAR REGRESSION COEFFICIENTS (95% CONFIDENCE INTERVAL) BETWEEN WORKPLACE FACTORS AND ANXIETY (N = 479)

	Model 1	Model 2†
PES–NWI	–1.09 (–2.15, –0.03)*	–1.16 (–2.20, –0.13)*
NAQ–R	0.16 (0.12, 0.21)***	0.16 (0.12, 0.21)***
Age	–	–0.05 (–0.12, 0.01)
Gender		
M/Other v. F	–	0.85 (–1.26, 2.96)
Ethnicity		
Euro v. non-Euro	–	–0.27 (–1.45, 0.91)
Relationship status		
Single/Other (v. M/D/C)	–	–0.54 (–1.71, 0.63)
In a relationship (v. M/D/C)	–	–0.72 (–2.43, 0.98)
Yrs. employed as a nurse	–	–0.05 (–0.12, 0.01)
Highest nursing qual.		
UG/other v. PG	–	0.52 (–0.62, 1.66)
Place of employment		
DHB v. non-DHB	–	0.70 (–0.32, 1.71)
Adjusted R^2	**0.156**	**0.204**

† Controlled for age, gender, ethnicity, relationship status, highest nursing qualification, years employed as a nurse, and workplace type.

PES-NWI = Practice Environment Scale - Nurse Work Index
NAQ-R = Negative Acts Questionnaire – Revised
M/D/C = Married, Defacto, Cohabitating
UG = Undergraduate, PG = Postgraduate

*p<0.05, **p<0.01, ***p<0.001

TABLE 8: MULTIPLE LINEAR REGRESSION COEFFICIENTS (95% CONFIDENCE INTERVAL) BETWEEN WORKPLACE FACTORS AND STRESS (N = 479)

	Model 1	Model 2†
PES-NWI	–2.63 (–3.83, –1.43)***	–2.50 (–3.70, –1.31) ***
NAQ-R	0.22 (0.17, 0.28)***	0.24 (0.18, 0.29) ***
Age	–	–0.04 (–0.12, 0.04)
Yrs. employed as a nurse	–	–0.03 (–0.10, 0.04)
Gender		
M/Other v. F	–	–0.36 (–2.79, 2.06)
Ethnicity		
Euro v. non-Euro	–	1.37 (–0.01, 2.73)*
Highest nursing qual.		
(UG/other v. PG)	–	0.39 (–0.92, 1.70)
Relationship status		
Single/Other (v. M/D/C)	–	–0.95 (–2.30, 0.40)
In a relationship (v. M/D/C)	–	–1.41 (–3.37, 0.55)
Place of employment		
(DHB v. non-DHB)	–	1.11 (–0.07, 2,28)
Adjusted R^2	**0.261**	**0.276**

Controlled for age, gender, ethnicity, relationship status, highest nursing qualification, years employed as a nurse, and workplace type.

PES-NWI = Practice Environment Scale – Nurse Work Index
NAQ-R = Negative Acts Questionnaire – Revised
M/D/C = Married, Defacto, Cohabitating
UG = Undergraduate, PG = Postgraduate

*p<0.05, **p<0.01, ***p<0.001

DISCUSSION

This study showed that New Zealand RNs experience psychological distress. Additionally, the quality of the practice environment and exposure to negative behaviours in the workplace were significantly associated with psychological distress in RNs after controlling for demographic characteristics.

Psychological distress was associated with ethnicity, with non-European respondents experiencing higher mean scores for depression and anxiety. This is a unique finding as it alludes to the potential influence of social factors such as discrimination or lack of social and cultural support that disproportionately affect non-European populations working as nurses in NZ.[12,44] Although not measured in this study, non-European nurses may have experienced racism from patients, their patient's families, and colleagues. A qualitative study that included 36 internationally qualified nurses (IQNs) working in NZ found that IQNs reported witnessing overt racism from patients and their families and covert racism from colleagues who questioned their capabilities.[44] The study also highlighted education, communication and cultural differences heightened IQN's stress and anxiety levels. Lastly, IQNs were less likely to report racist or discriminatory behaviour as they were often concerned with appearing compliant in order to integrate with the team and the healthcare organisation system.[44] Psychological distress in this study was associated with a greater intention to leave. This finding is consistent with previous studies, including research with primary healthcare nurses in Macedonia,[45] clinical nurses in Taiwan,[46] and palliative care nurses in Saudi Arabia.[47] Due to nurse shortages, targeted mental health support is needed for nurses from diverse backgrounds to retain them in the workforce. Failure to address psychological distress in nurses may exacerbate the nursing shortage and compromise the quality and safety when delivering patient care.

Like other studies, age was negatively associated with anxiety and stress, while years employed as a nurse were negatively associated with anxiety.[15,48] This finding suggests that older nurses or nurses who have worked for longer are more resilient to the effects of workplace stress. Younger or less experienced nurses may benefit from additional organisational support such as ongoing mentorship opportunities, as well as skill and leadership development workshops, to reduce psychological distress and smoother transition to practice.

Psychological distress as measured by depression, anxiety, and stress average scores in this study were somewhat consistent with previous studies. The mean scores were comparable to those of a study involving Queensland (Australia) nurses.[20] Like the current study, the study of Queensland nurses included nurses from various healthcare settings. In contrast, other studies produced higher average scores for depression, anxiety, or stress.[21,49,50] Higher mean scores could be attributed to data collected during the COVID-19 pandemic, which has resulted in increased demands on the global health workforce.[49] Higher mean scores may result from nurses working exclusively in mental health settings.[21] Psychiatric nursing is considered one of the more stressful nurse roles, with nurses often experiencing high rates of verbal and physical violence.[51] Anxiety and stress average scores were higher in a survey of 600 Vietnamese nurses.[50] Differences in average scores between this study and a previous study with Vietnamese nurses may relate to the sample of Vietnamese nurses being, on average, younger and having worked fewer years as a nurse. Differences may also result from poorer working and pay conditions experienced by Vietnamese nurses.[50] Differences in depression, anxiety and stress scores across these studies may be explained by cultural differences. Cultural differences have been shown to influence nurse outcomes in previous comparative studies.[52]

Psychological distress in the current study was not associated with sample characteristics such as gender, relationship status, highest nursing qualification, employment type, or place of employment. This contrasts with the findings from a study involving intensive care unit (ICU) nurses in Australia and New Zealand, which showed significant associations with gender, ethnicity, age group, and country for bullying and discrimination.[12] This could be explained, in part, by the differences in sample composition. One possibility is that the inclusion of nurses from various settings might dilute the effect of variables specific to high-stress environments like the ICU. ICU nurses might face a unique set of stressors that could make them more vulnerable to factors associated with bullying and discrimination. The timing of the data collection may have also influenced the results. Data collection for the current study occurred before the COVID-19 pandemic, while the study with ICU nurses occurred during the pandemic.

To our knowledge, this is the first study using the PES-NWI and DASS-21 together in RNs. The results show that the practice environment is associated with indicators of psychological distress in NZ RNs. This finding aligns with previous studies investigating the state of the work environment and psychological distress in nurses. For instance, a study with Canadian nurses found that workplace relations, inadequate organisational support, and insufficient resourcing were associated with depression and anxiety. Data in the Canadian study was collected during the pandemic, while over 60% of nurses worked in acute care settings, and over 80% of nurses worked in urban or suburban areas.[53] A study with Chinese public hospital nurses showed depressive symptoms were associated with workplace violence, working long hours (>45 hours per week), and regular night shifts (>2 nights per week).[54] A study involving three hospitals in New York (USA) found conflict at work, lack of leadership support, unclear work assignments and unclear workplace goals were all associated with depression and anxiety in RNs.[55]

To our knowledge, this is the first study using the NAQ-R and DASS-21 together to measure the relationship between negative interpersonal behaviour and psychological distress in RNs. Negative acts in the workplace, such as bullying, intimidation and harassment, were associated with depression, anxiety, and stress. Although using different tools to measure depression and anxiety, this finding aligns with a study conducted in Bandar Abbas, Southern Iran, which found moderate positive associations between bullying and both anxiety and depression in nurses from private and public hospitals.[56]

LIMITATIONS

There are several limitations to this study. Firstly, due to a low response rate, the study's findings might not be generalisable to the entire population of New Zealand registered nurses. This means the results may not accurately reflect the experiences and perspectives of the entire population. Secondly, the available data did not allow for analysis regarding the nurses' scope of practice. This limits the ability to understand potential variations in experiences based on specific practice areas. Thirdly, the study may be susceptible to selection bias. Individuals who are feeling stressed, anxious, or bullied may have been more likely to participate, potentially leading to an overrepresentation of these experiences in the data. This could skew the overall understanding of the experiences of New Zealand registered nurses. Despite these limitations, the study provides a foundation for further research and highlights the potential challenges encountered by some New Zealand registered nurses. These limitations can be addressed in future studies by combining surveys with focus groups or interviews, which can enhance generalisability and provide a deeper understanding of nurses' experiences across different practice areas.

IMPLICATIONS FOR RESEARCH, POLICY, AND PRACTICE

Healthcare providers must prioritise modifying the work environment to address the factors contributing to nurses' psychological distress. This may include mandating safe nurse-to-patient ratios, offering flexible scheduling, guaranteeing protected breaks, mentorship programmes, and initiatives to reduce discrimination in the workplace. They must implement early intervention programmes that identify and address signs of psychological distress in nurses, with specific culturally tailored mental health resources and support for those with diverse backgrounds and experiences. Future research should examine how organisational-level strategies can reduce psychological distress in nurses.

CONCLUSION

The results show that the quality of the practice environment, including resource adequacy, the availability of individual and organisational level support, and exposure to negative acts in the workplace - such as bullying and harassment - were associated with indicators of psychological distress in RNs.

Acknowledgements: Australian Government's support through an "Australian Government Research Training Program Scholarship", NZ Nurses Organisation (study endorsement, recruitment), and the participants who gave their time to provide the data for this study.

Funding Support: This research was completed as part of a Doctor of Philosophy. No additional funding was secured by the PhD candidate to fund the costs associated with the project.

Declaration of conflicting interests: None

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REVIEWS AND DISCUSSION PAPERS

Choosing wisely: needle length and gauge considerations for intramuscular and subcutaneous injections

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ABSTRACT

Objective: This article aims to address knowledge gaps and misconceptions among healthcare professionals regarding needle selection (specifically the length and gauge/size chosen) for intramuscular (IM) and subcutaneous (SC) injections. It investigates the impact of needle selection on injection efficacy and adverse effects, considering factors, such as, needle length, size, patient characteristics, and medication requirements. It also aims to evaluate current injection guidelines against research findings from the past two decades, identifying areas requiring revision or updating.

Methods: The discussion paper employs a literature review, including an analysis of past research that employs imaging techniques, such as, CT and ultrasound to examine tissue depth in both IM and SC injection practices; the author's extensive experience across various clinical settings, including immunisation, primary care, and acute care settings. The author's roles as academic staff and a clinical facilitator allow for the identification of gaps between theoretical knowledge and practical implementation in injection practices. These insights contribute to a comprehensive understanding of the challenges faced by healthcare professionals.

Results: The study reveals significant discrepancies in needle selection practices, with traditional methods often diverging from evidence-based recommendations. Challenges noted include reliance on needle hub colour coding for IM and SC injections and insufficient understanding regarding the rationale behind these injection methods. Another additional barrier is interpreting needle packaging information to identify the actual needle length for injection. Staff training and education is essential to improving accuracy and safety in injection practices. Further, patient characteristics, such as, weight, BMI, gender, and injection sites were found to impact needle selection, highlighting the need for tailored approaches. The article suggests that inconsistent and outdated guidelines from various agencies in injection practices and techniques often lack robust scientific rationale.

Implications for research, policy, and practice: The findings and recommendations have significant implications for healthcare policies and guidelines. They highlight the need to incorporate research findings to update current guidelines, ensuring safe and effective injection practices across all clinical settings. An algorithmic flow chart could be developed to reflect the above concerns.

What is already known about the topic?

- Nursing textbooks often differ in IM and SC procedures, with some based on non-evidence-based recommendations.
- Unsafe injections have severe consequences, including increased morbidity and mortality, along with substantial medical costs.
- Complications like muscle fibrosis, abscesses, gangrene, and nerve injury may arise. Inappropriate injections can result in subtherapeutic absorption and reduced medication efficacy.

What this paper adds:

- This article highlights the overreliance on traditional practices in injection procedures and advocates for nurses to embrace evidence-based approaches in their injection techniques.
- It also emphasises the importance of proper needle selection, including the correct identification of length and gauge/size (rather than relying solely on the needle colour hub for IM/SC injections), to ensure medication efficacy and patient safety.
- This shift towards best practice is anticipated to enhance nursing proficiency in intramuscular and subcutaneous injections, ultimately leading to improved patient outcomes.

Keywords: Drug efficacy and adverse reactions; Evidence-based practice; Injection practices; Intramuscular (IM) injections; Needle length and size; Parenteral administration; Patient safety; Knowledge deficits; Subcutaneous (SC) injections

INTRODUCTION

Administering injections is a critical responsibility in nursing that demands extensive knowledge and expertise. Nurses must have a thorough understanding of injection techniques, appropriate needle size and length, medication requirements, and potential complications of injections. Unfortunately, traditional injection practices are still being used even though research spanning several decades has revealed evidence that contradicts these practices.[1-3] Many nursing fundamentals textbooks recommend different injection procedures based on traditional and non-evidence-based practices.[4]

Although guidelines dictating needle length for intramuscular (IM) and subcutaneous (SC) injections exist, they vary and do not always reflect evidence-informed practice, leading to confusion among healthcare professionals. In Australia's healthcare landscape, there are discrepancies in injection practices within hospitals and primary healthcare facilities, which have the potential to jeopardise patient safety. Standard 4 of the National Safety and Quality Health Service (NSQHS) on Medication Safety and the Primary Health Care Standards emphasises the safe and appropriate use of medicines, including injections, in order to minimise harm to patients.[5] Healthcare providers must have the knowledge, skills, and training to administer medications safely. The Primary Health Care Standards require healthcare providers to implement evidence-based practices and clinical guidelines to ensure appropriate patient care. However, the lack of updated guidelines that reflect current research findings, coupled with inadequate training and knowledge among staff members, can compromise patient safety.

The article investigates common injection practices among nursing professionals in Australia, shedding light on knowledge gaps and misconceptions surrounding needle selection for both IM and SC injections. It also addresses challenges stemming from differences in manufacturers' products and measurement units across countries.

The importance of needle gauge selection is also explored, considering various factors influencing the choice of needle.

The final section focuses on needle length, examining IM and SC injection practices individually. It investigates how various factors influence injection efficacy, such as, patient gender, size/BMI, site of injection, and medication property. It also utilises previous research findings to improve comprehension and identify areas for improvement.

THE IMPORTANCE OF ACCURATE NEEDLE GAUGE AND LENGTH

Selecting an appropriate needle size and length is critical for ensuring the safe and effective delivery of medications to an intended site. Unsafe injection practices have been shown to have significant negative impacts on patient health, including increased rates of morbidity and mortality, as well as millions of dollars spent on direct medical care.[6] The Government of Western Australia *Vaccine Safety Surveillance Annual Report 2021* for childhood vaccination revealed injection site reactions to be the most common adverse event following immunisation.[7] Aside from common adverse effects, such as, pain, bruising, and hematoma formation,[7] other complications may be associated with IM or SC injections. These include sciatic nerve injury, particularly with IM injection in the upper outer quadrant of the buttock; osteomyelitis if the IM injection is too deep and the formation of granulomas, fat necrosis, and calcification

following SC injections.[8-10] When administering insulin, the appropriate needle length is critical for achieving optimal glycaemic control and avoiding complications, such as, fluctuations in blood glucose levels, needle phobia, and poor treatment compliance.[11]

KNOWLEDGE OF INJECTION TECHNIQUES AND NEEDLE IDENTIFICATION

Studies have shown that healthcare professionals may receive insufficient training in injection techniques, and therefore, may need ongoing education and training to narrow the knowledge gap about techniques.[12] Various approaches have been described, such as the z-track method, 45/90-degree needle insertion, and skin flattening or bunching (squeezing).[1, 13, 14] However, the techniques often overlook the importance of selecting the right needle gauge and length for the injection. Both the technique and needle specifications are vital for success. In a study by Davidson and Bertram, the bunching technique was successful in nearly 80% of deltoid IM injections, using a 25 mm needle in older adults, while flattening led to over-penetration more than 85% of the time.[15] A 32 mm needle over-penetrated the deltoid muscle, posing a high risk of hitting the bone, whether a bunching or flattening technique was used.[15] Nurses have stated that they use either technique out of habit, but they must understand the rationale for their actions and consider the appropriate needle stock and technique to ensure accuracy and safety.

It is a common misconception among both novice and experienced nurses in Australian healthcare settings that the colour of the needle hub indicates how the needle should be used. For instance, there is a common belief that orange-hubbed needles are solely for subcutaneous (SC) injections, while blue-hubbed needles are IM injections, aligning with the familiar nursing adage "blue for IM and orange for SC".[16] However, this assumption is not always accurate and may lead to erroneous administration, such as, giving an intramuscular (IM) injection into subcutaneous (SC) tissue or vice versa.

A universal standard established by the International Organisation for Standardisation (ISO) has been implemented to standardise the colour coding of hypodermic needle hubs globally.[17] Needles with hubs of the same colour, such as, green, come in several lengths. For example, orange-hub needles can be 16, 25, or 38 mm in length, and blue-hub needles can be 16, 19, 25, or 32 mm in length. Therefore, relying on the hub colour to determine the needle's intended use can lead to confusion and errors (Figure 1).

Another issue is that nurses may choose a needle because it is available in the needle stock in their ward or clinic, even though it is inappropriate for the type of injection given.

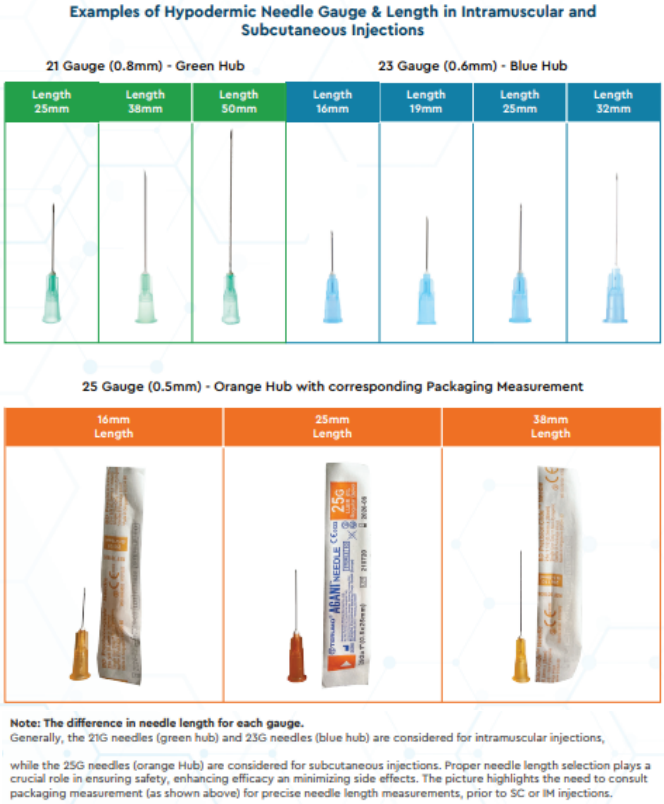

FIGURE 1. COMMON NEEDLE SIZES/LENGTH FOR IM AND SC INJECTIONS

Healthcare professionals may not be aware of the numbers and types of needles manufactured by various companies or informed of changes in companies' current practices. The length of the needle is indicated on the packaging, along with other relevant information, such as, the gauge. Frequently, the print on needle packages is small and hard to see, as for the 25G orange-hub needle in Figure 1. Many manufacturing companies display pictures of needles with hubs of various colours on their websites. However, there is often no visual indication of the different needle lengths associated with each hub and its gauge. This lack of clarity can be confusing and lead to misunderstandings among the public and healthcare professionals alike.

The units of measurement for needle length vary in different countries, and this may confuse healthcare professionals who are training or practising in a country different from the one in which needles are manufactured. For example, needle length is measured in inches in the United States, but in millimetres in other countries, such as, Australia and the United Kingdom. Unfamiliarity with different units of measure can result in errors when selecting needle lengths. In this paper, we focus on needle lengths in millimetres.

NEEDLE GAUGE: A BALANCING ACT BETWEEN INJECTION PRESSURE, PAIN, AND BLEEDING RISK

The needle gauge (G) system is an internationally recognised scale used for needle sizing, established by the International Organization for Standardization (ISO).[17] The size of a needle, or the diameter of the needle's lumen, is crucial.[18] Gauges range from 7 (the largest) to 33 (the smallest); the higher the gauge number the smaller the needle diameter (Table 1).

TABLE 1. NEEDLE GAUGE AND DIAMETER

Needle Gauge (G)	Diameter (mm)
18	1.2
19	1.0
21	0.8
22	0.7
23	0.6
25	0.5

Hypodermic needles follow the ISO colour coding system for identification, with the examples shown below ranging from larger to smaller (Figure 2).

Selecting an appropriate needle gauge is crucial for ensuring effective medication delivery, while minimising pain and local reactions. Considerations should include injection pressure, pain reduction, bleeding risk, local reactions, and the viscosity of the solution being administered.[19] Nurses must critically assess various factors when choosing the right needle gauge for administration.

Hunter recommended the use of a 21G needle for IM injections in adults to ensure accurate administration into the muscle.[16] The validity of this claim is brought into question when the recommendation is made without considering the needle length, medication type, or patient-specific factors. Additionally, needle gauges have been shown to significantly affect the frequency of pain during needle insertion. Using a smaller gauge needle, such as, a 31G, can reduce the likelihood of pain compared with larger gauge needles, such as, 27G or 28G.[16] Decreasing the needle diameter has been observed to decrease the likelihood of bleeding during insertion.[18]

NEEDLE GAUGES FOR VARIOUS FORMULATIONS AND LEVELS OF VISCOSITY

When selecting the needle gauge, it is important to consider the viscosity (thickness) and volume of the solution being administered. High-viscosity solutions, such as, certain forms of testosterone, Fulvestrant (oncology therapy), and oil-based antipsychotics, necessitate a wider bore needle to facilitate easier administration and reduce the risk of localised tenderness and erythema.[20] These formulations often come in larger volume (>3mL). By opting for a wider bore needle in IM injections, the pressure required to administer solutions can be reduced. Conversely, smaller gauge needles may require more force to be used in administering injection against resistance or pressure. The primary objective of this approach is to disperse the medication over a broader area, effectively minimising the likelihood of local reactions. A 21G with a longer-length needle is recommended for injection in appropriate sites.[20]

According to Diggle, in infants and children, using a wider gauge needle, such as, a 23G, may slightly decrease the incidence of local reactions compared with a 25G 16-mm needle while still achieving a comparable immune response.[21]

CLINICAL IMPLICATIONS OF NEEDLE SELECTION

It is important to select an appropriate needle gauge based on patient characteristics and the specific medication being administered, aiming to balance pain reduction, injection depth, and the risk of local reactions. Consider the viscosity (thickness) and volume of the solution when selecting the needle gauge, especially for high-viscosity formulations, such as testosterone or hormonal drugs. A wider-needle gauge needle, such as a 21G (green-hub) needle, may facilitate a smoother flow of solution from the syringe through the needle than a 25G (orange-hub) needle. Regarding infants and children, a 23G or 25G needle for IM injections should be considered to disperse the medication and reduce the risk of local reaction.

NEEDLE LENGTH FOR INTRAMUSCULAR INJECTIONS

Injections into muscle (IM injections) are used for medications that require rapid absorption into the bloodstream, such as, certain vaccines, antibiotics, hormones, and pain relief medications. Muscle tissue is more vascular than SC tissue. Administering an SC injection instead of an IM injection into muscle tissue can lead to improper drug absorption, which can affect a medication's effectiveness.[6] Additionally, adipose tissue retains injected material for longer periods than muscle, so injections into adipose tissue have an increased potential for adverse effects. IM injections are defined as injections in which the needle tip pierces the muscle by at least 5 mm (Figure 3).[20]

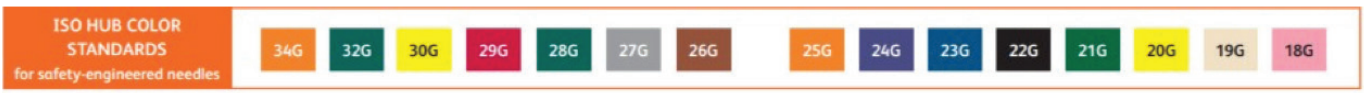

FIGURE 2. ISO HUB COLOUR STANDARD FOR SAFETY-ENGINEERED NEEDLES [17]

 https://doi.org/10.37464/2024.413.1235

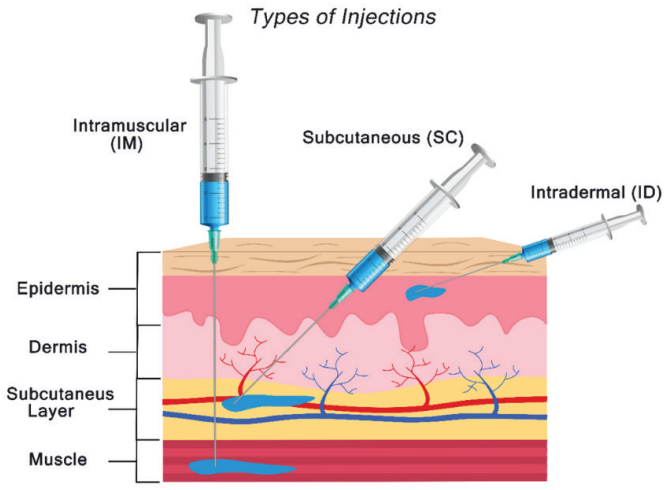

FIGURE 3. NEEDLE PENETRATION DEPTH FOR IM AND SC INJECTIONS

The most common sites for IM injection include:

- The deltoid muscle of the arm,
- The vastus lateralis muscle of the thigh,
- The ventrogluteal muscle of the hip, and
- The dorsogluteal muscles of the buttocks (historically used, but less recommended at present due to safety concerns).

FACTORS AFFECTING THE EFFICACY OF IM INJECTIONS

The choice of needle is usually at the discretion of the person administering the injection, although there may be guidelines on choice that can be consulted. Certain IM injections, such as, those for depot antipsychotics, come with pre-packaged needles and specific instructions. Needles used for IM injections are typically 25 to 38 mm (1 to 1.5 inches) long and 19G to 25G. For instance, a 25G needle 25 mm long is recommended for influenza and COVID-19 vaccinations in Australia.[14]

In selecting the right needle, it is essential to consider the patient's characteristics, such as, weight, BMI, gender, age, injection site, muscle size, and the volume of material to be administered, and to base the decision on the individual patient to ensure the needle reaches the appropriate tissue layer.[14, 22, 23] The depth of injection is also influenced by the needle size and appropriate injection technique (for instance, flattening or pinching a skinfold). Correct landmarking of the injection site is just as essential to ensure optimal practice.

WEIGHT AND BODY MASS INDEX

Sebro identified a strong correlation between weight and BMI with the deltoid SC fat pad in both men and women.[25] The findings suggest that, as weight and BMI increase, there is a corresponding increase in the thickness of the deltoid SC fat pad. The increasing prevalence of obesity presents a significant challenge when administering IM injections, as longer needles may be required to reach the deltoid muscle.

In individuals with higher BMIs, a shorter needle may result in under-penetration, leading to decreased injection efficacy. White and colleagues conducted a retrospective review and found that, in most instances, IM medications were inappropriately administered, with needle length not determined based on BMI, resulting in a minimal possibility of true IM penetration.[24] It was found that appropriate needle sizes were more likely to be chosen when medication instructions were provided.[24]

Hemingway, Lui and White have advocated an assessment of obesity status before selecting length for IM injection in both genders.[27,25] They suggest that deltoid injections are more likely to achieve muscle penetration in people who are overweight or obese, independent of their gender.

The clinical implications of weight and BMI for IM injections are as follows:

- It is critical to make careful needle selections and update current immunisation guidelines to address this issue. While The Australian Immunisation Handbook currently recommends a 38 mm needle for very "large or obese individuals",14 this may not account for the individual BMI, leaving the choice open to subjective interpretation by clinicians. More specific guidelines based on patient BMI are needed to ensure accurate and effective delivery of IM injections.
- Deltoid injections are more likely to achieve muscle penetration in overweight or obese populations, independent of their gender.

Gender

Previous research has shown that gender differences exist in adiposity patterns, with females having thicker SC layers and thinner muscle layers than males with the same BMI.[28-30] This finding implies that a 25 mm needle may not consistently reach the deltoid muscle in heavier women. According to Sebro, a 25 mm needle was able to reach the muscle in only 85.3% of women weighing less than 90 kg and 98.6% of women weighing less than 118 kg.[26]

Injecting a vaccine that is intended for IM injection into the SC fat layer can lead to poor vascularity, resulting in slow mobilisation and processing of antigens. This has been shown to cause vaccine failure in diseases such as hepatitis B and influenza.[27]

The clinical implications of gender for IM injections are as follows (Table 2):

- A needle length of 25 to 32 mm is suitable for most adults (for instance, weighing 60 to 90 kg) for IM injections into the deltoid muscle. Patients who are emaciated require shorter needles for IM injections.
- Consider using a 38 mm needle for women weighing more than 90 kg or having a high BMI and for men weighing more than 120 kg.

TABLE 2. CURRENT INJECTIONS GUIDELINES VERSUS RESEARCH FINDINGS AND IMPLICATIONS

Recommended needle size, length, and angle for administering vaccines *Australian Immunisation Handbook* **(2023)**		
Age or size of person to be vaccinated	**Needle type**	**Angle of needle insertion**
Infant, child or adult for intramuscular vaccines	22–25-gauge, 25 mm long	90° to skin plane
Preterm infant (<37 weeks gestation) up to 2 months of age, and/or very small infant	23–25-gauge, 16 mm long	90° to skin plane
Very large or obese person	22–25-gauge, 38 mm long	90° to skin plane
Subcutaneous injection in all people	25–27-gauge, 16 mm long	45° to skin plane
Intradermal injection in all people	26–27-gauge, 10 mm long	5–15° to skin plane

Research findings with clinical implications on IM and SC injection practices	
Intramuscular injections (IMI)	**Subcutaneous injections (SC)**
• Increase awareness about variability in needle length and gauges, as relying on needle hub colour can lead to errors. Needles of the same hub colour can vary in length. Provide training and consider patient weight/BMI, gender, injection site, and medication type when choosing injection needles. **Gauge considerations** • For viscous/thick solution, use a wider gauge needle (e.g., 21G green hub) for smoother solution flow. Tissue irritation can occur when injecting a solution into the skin at high pressure with a smaller bore needle (e.g., a 25G orange hub needle). • For IM injections in infants, use a 23G or 25G needle to ensure better medication dispersion. **Length considerations** • Needle range from 25-32 mm is appropriate for most adults (e.g. 60-90kg) for deltoid IM injections. Consider using a 38 mm needle for women weighing more than 120kg. • Bunching technique (squeezing) with a 25 mm needle, to be used for deltoid IM injections in non-obese older adults, to avoid overpenetration of deltoid muscles and hitting the bone. • Use needles longer than 37 mm for gluteal injection in all females but avoid gluteal injections in obese females. • Ultrasound-guided and correct needle length selection improve accuracy. • In obese patients, consider using the thigh for IM injections if needle stocks are limited. • Deltoid injections are more likely to achieve muscle penetration in overweight or obese individuals, regardless of gender.	• Insufficient SC tissue/muscle mass may result in unintentional penetration into bone, leading to discomfort or osteomyelitis. This risk increases with longer SC needles, often due to the clinician's limited understanding of needle lengths. Refer to Figure 1. • Longer needles increase the risk of inadvertent IM injections, causing variable absorption and potential adverse effects, even with 13 mm needles. Risk is lower with 5 mm needles in children. • Techniques like the raised skinfold method can help reduce the risk of inadvertent IM injections. • BMI predicts skin-to-muscle depth, influencing absorption rates and increasing adverse effects. For immunotherapy, consider a 4 mm needle at a 45-degree angle to minimise inadvertent IM injections. • The disparity in recommended needle lengths persists, especially between diabetic and nondiabetic populations, adults/versus paediatric population, highlighting the need for updated guidelines. • Shorten pen needles (4 or 5 mm) are as effective as longer needles without increasing insulin leakage. • Manufacturer to redesign their product packaging for easier identification of needle length and measurement unit. • Urgent need for updated guidelines and further research to determine optimal needle length for different patient populations and injection sites, based on scientific evidence.

- Tollefson and Hillman recommended selecting a needle length that is half the width of the skinfold when it is pinched at the injection site.[28]

Anatomic site of injections

Dorsal and ventral gluteal sites

Several studies have reported low success rates for IM injections at dorsal and ventral gluteal sites, with drugs often being delivered into SC tissue instead of muscle, leading to reduced bioavailability.[29, 30] The problem is further compounded by the increasing obesity of people in all developed and many developing countries. This situation is particularly pertinent in the case of administering long-term depot antipsychotic injectables, where improper injection techniques can lead to impaired absorption, therefore, leading to poor control of symptoms for the intended duration.[31] This concern is heightened in patients with metabolic syndrome, many of whom are obese.[32]

Hemingway, Lui and White recommend for needles longer than the standard 37 mm at both gluteal sites, independent of obesity status. Injections into gluteal sites should be avoided in females who are obese.[25] Strohfus and colleagues conducted a systematic review and recommended the use of ultrasound-guided IM injections when the depth from skin to muscle was uncertain.[11] Proper landmarking and appropriate needle length were crucial for ensuring accurate IM injection placement.

Vastus lateralis site

Zaybak and colleagues conducted a study using sonography to measure the thickness of SC tissue in the dorsogluteal muscle and thigh.[23] They found that the SC tissue was thicker at the dorsogluteal site than in the thigh. The study concluded that a standard needle was effective for IM injections in the rectus femoris and vastus lateralis sites for all men and 77.8% of women. However, for individuals with a BMI greater than 24.9 kg/m^2, a standard 38 mm needle may not reach the muscular tissue at the dorsogluteal site.

The clinical implications of the anatomic site of IM injections are as follows (Table 2):

- Use needles longer than 37 mm for gluteal injection in all females but avoid gluteal injections in obese females.
- Proper landmarking and education are crucial for dorsogluteal IM injections.
- Ultrasound-guided and correct needle length selection improves accuracy.
- In obese individuals, utilising the thigh instead of the dorsogluteal site may be an option, particularly when needle stocks in the ward are limited.

NEEDLES FOR SUBCUTANEOUS INJECTIONS

In an SC injection, medication is injected into the fatty layer of tissue just beneath the skin (Figure 3). Medication injected into the SC layer is absorbed into the bloodstream more slowly than medication given by intravenous infusion or IM injection, and it therefore has a longer-lasting effect. Common medications administered subcutaneously include insulin for diabetes, anticoagulants for blood clot prevention, growth hormones, vaccines, and certain biologic therapies for conditions, such as, rheumatoid arthritis or psoriasis. Injections are typically given in the abdomen, thigh, or upper arm and have smaller volumes than IM injections.

The SC route is also used for the administration of local anaesthetics and drugs used in palliative care, such as fentanyl and morphine.

Typically, the needle for an SC injection ranges from 25G to 31G, and the length can vary from 4 to 16 mm. In general, shorter and thinner needles are preferred for SC injections to reduce the risk of accidentally injecting the medication into muscle tissue or a blood vessel.

REASSESSING THE LENGTH OF SUBCUTANEOUS NEEDLES: WHICH ONES ARE TOO LONG FOR OUR PATIENTS?

The effectiveness of SC injections is significantly impacted by the needle length used. The thickness of SC tissue varies based on the patient's body composition and the injection site, and it can impact the medication's absorption rate and efficacy. A poor understanding of the technique could result in the accidental administration of an intended SC injection into muscle tissue, and this could negatively impact the rate of absorption and potentially harm the patient. Cook highlighted that in rare cases when there is insufficient SC tissue and/or muscle mass, a needle can inadvertently penetrate bone or osseous tissue.[33] This can lead to discomfort due to a bony contusion or, in more severe instances, osteonecrosis. The risk of these complications is heightened when clinicians unknowingly use a longer SC needle because of a lack of knowledge about needle lengths and unfamiliarity with recognising needle length information on packaging.

Research has been ongoing for several decades on the appropriate needle length for SC injections, particularly for insulin delivery for diabetes management. Early imaging studies in the 1980s raised concerns about needle lengths being longer than the measured depths of SC tissue at different body sites, leading to an increased risk of inadvertent IM injection and subsequent variability in insulin absorption.[38] Recent research by Liyanage and colleagues has shown that there is still a high risk of inadvertent IM injection with currently used needles, particularly 13 mm needles; the risk of inadvertent IM injection was approximately 60% with 13 mm needles without a skinfold at the arm and thigh.[34] Kodikara and colleagues found that the risk of inadvertent IM injection was high with 15 mm needles and low with 5 mm needles in the paediatric population.[35] Regardless of the needle length used, the raised skinfold technique was associated with a reduced risk of inadvertent IM injection. Other studies have also shown that shorter pen needles (for example, 4 or 5 mm versus 12.7 mm) do not affect efficacy or insulin leakage, regardless of BMI.[36] The International Scientific Advisory Board for The Third Injection Technique Workshop released recommendations for best practices for injection techniques for patients with diabetes. It concluded that 4 mm pen needles were efficacious in all patients irrespective of BMI.[37]

An ultrasound study conducted by Kim and colleagues found that most patients receiving SC allergen immunotherapy had a skin-to-muscle depth less than the standard allergy syringe needle length of 13 mm.[38] This poses a risk of IM injection and an increased risk of anaphylaxis. To mitigate this risk, the authors recommended using a short 4 mm needle at a 45-degree angle to the skin. Additionally, the study showed that BMI was a significant predictor of skin-to-muscle depth, leading to inconsistent absorption rates and an increased risk of adverse effects.

The clinical implications of needle length for SC injections are as follows: (Table 2)

- Using a needle length that is longer than necessary can result in inadvertent IM injections, leading to variable medication absorption and potential adverse effects. The risk of inadvertent IM injection was high with 15 mm needles and low with 5 mm needles in the paediatric population.
- Studies have shown that shorter pen needles, such as those of 4 or 5 mm, can be as efficacious as longer needles without affecting insulin leakage.
- Techniques, such as, the raised skinfold method, may be employed to reduce the risk of inadvertent IM injections.

ARE CURRENT SUBCUTANEOUS INJECTION GUIDELINES IN THE AUSTRALIAN HEALTHCARE SYSTEM REFLECTIVE OF EVIDENCE-BASED PRACTICE?

To ensure safe and effective injection practices, healthcare professionals must have access to up-to-date guidelines and training. A search for guidelines on injection practices in Australia, by Annersten and Willman, showed that the available information was "spotty" and inconsistent and that some guidelines were not aligned with the scientific data that has emerged from decades of research.[39] Inconsistent guidance on SC injection techniques was found across various sources, such as, course literature, patient education pamphlets, and instructional leaflets.[39] The review examined 38 relevant articles from three databases, all of which emphasised the significance of the quantity of SC fat and the appropriate needle length in ensuring accurate drug delivery to the intended target tissue. However, the scientific evidence supporting the technical performance of SC injection is limited, highlighting the need for additional research in this area. Due to the lack of consistency, clinicians are often left to rely on their judgment when it comes to injection practices.

The available guidelines, such as, those from The Australian Immunisation Handbook [14] (Table 2), the Becton Dickinson (BD) Principles of Injection Technique,[40] and the Australian Diabetes Educators Association (ADEA), offer some recommendations on needle length selection for different injection types. The ADEA's Clinical Guiding Principles for Subcutaneous Injection Technique has published a comprehensive chart on needle length selection for insulin injection, and generally, shorter needle lengths are recommended (for instance, 4 to 6 mm).[41] BD recommends a needle of 4 to 13 mm (for instance, 29G to 32G) for insulin delivery and a needle of 13 to 16 mm (for instance, 26G to 31G) for other injections at a 45- to 90-degree angle of injection. The Australian Immunisation Handbook provides guidelines for SC injection using a 16 mm needle for all adults and children at a 45-degree angle to the skin.[14] There is no option for smaller needles to accommodate various patient characteristics. The handbook does not mention the use of the skin pinch-up technique or raised skinfold for individuals with less SC fat or paediatric patients, which reduces the risk of IM injection. However, it is important to note that evidence regarding SC injections suggests that a 16 mm needle, even when administered at a 45-degree angle, may be too long.[34-36, 38] This raises concerns about the potential risk of inadvertent IM injection. Further research is needed, particularly on the adult and paediatric populations, to thoroughly investigate and understand the optimal needle length for SC injections.

Taking into consideration factors, such as, age, physical condition, and medication requirements, it is evident that there is still a significant disparity in recommended needle lengths, particularly between diabetics and nondiabetics (assuming we are all the same physiologically). This highlights the need for further research and the standardisation of guidelines.

The clinical implications of evidence-based practices for SC injections are as follows:

- Risk of IM injections: The current recommended use of a 16 mm needle even at a 45-degree angle for general SC injections and immunisations raises concerns about the risk of inadvertent IM injections.
- There is a need for the updated standardisation of guidelines from various agencies and for further research to determine the optimal needle length for SC injections in different patient populations and at different injection sites.

SUMMARY OF CONSIDERATIONS FOR SUBCUTANEOUS INJECTIONS

In conclusion, the length of the needle used in SC injections is an important factor that significantly impacts the effectiveness of medication delivery. Accidental injection into muscle tissue or bone can occur when a longer needle is used. The available guidelines in the Australian healthcare system are inconsistent and may not reflect current evidence-based practices. Inconsistencies in guidance on SC injection techniques and needle length selections pose challenges for healthcare professionals, who are left to rely on their judgment.

CONCLUSIONS AND RECOMMENDATIONS

Administering injections is a critical nursing responsibility requiring extensive knowledge and expertise in techniques, needle selection, medication requirements, and potential complications. Despite decades of research contradicting traditional practices, many nursing practices and textbooks still recommend outdated methods, leading to confusion due to inconsistent guidelines for intramuscular and subcutaneous injections.

The current reliance on needle hub colour coding (typically "blue" for IM and orange for SC injections amongst nursing/medical professionals), rather than understanding how to interpret needle packaging information (with the same colour hub coming in various lengths, thereby causing error and confusion), is a concerning practice. Encouraging manufacturers to prioritise packaging design with prominent labelling for a clear visual representation of needle length can aid clinicians in selecting the appropriate needle, thereby reducing injection errors.

Discrepancies in injection practices across healthcare settings pose potential risks to patient safety with unwarranted adverse reactions and suboptimal efficacy of medications being administered. Proper needle selection in terms of length and gauge, combined with correct injection technique, is essential for effective injections. This process also requires consideration of medication properties, such as, viscosity and pharmacokinetic features (for instance, long-acting depot), along with patient-specific factors like weight, BMI, gender, and the chosen anatomical sites.

In choosing the correct gauge for thick/viscous solutions, a wider bore needle (for example, green hub) is indicated, to reduce localised tenderness and erythema.

The weight and BMI of the patient influence the needle length, with individuals with high BMIs potentially requiring longer needles for proper muscle penetration. Gender differences in adiposity patterns should be considered, as longer needles may be needed to reach muscles in females than in males with the same BMI. It is also important to consider longer needles for dorsogluteal and ventrogluteal sites due to the presence of a significant amount of SC tissue in these areas. Ultrasound guidance and accurate landmarking can enhance injection accuracy.

To accommodate the diverse needs of patients, it is just as crucial to ensure that healthcare facilities maintain an adequate stock of needles of various lengths. Clear labelling and good stock organisation are essential to minimise confusion and ensure the correct selection of needles.

Furthermore, proper training of healthcare professionals is paramount. Educational institutions should integrate comprehensive programs to equip staff and students with the necessary knowledge and skills in injection practices. After all, the art of injection is part of our "bread and butter", and we should be familiar with the "tools" we use.

Governing bodies, such as, the Australian Technical Advisory Group on Immunisation (ATAGI) and the National Safety and Quality Health Service (NSQHS), should adopt evidence-based guidelines on needle length and gauge for IMI and SC injections. These guidelines should reflect the research findings from the last two decades to ensure both safety and efficacy. Interventions, such as, evaluating the effectiveness of educational programs and implementing quality improvement initiatives, could significantly enhance injection safety and accuracy. Future research endeavours could delve deeper into areas critical for optimal injection practices.

LIMITATIONS

The scope of the literature review may be limited, potentially overlooking relevant studies that could influence the findings. Time constraints may have prevented a comprehensive analysis of all relevant factors. While we discuss the impact of needle length and gauge, the precise identification of injection sites and correct injection techniques (for instance, Z-track versus skin bunching) and their implications for injection efficacy and patient outcomes warrant further investigations. The interplay between the aforementioned factors presents another intriguing aspect that could impact injection success. Further research exploring these interactions is essential for developing more comprehensive and effective guidelines. It is too expansive to explore fully within this study. Additionally, subjective interpretations by the writer may introduce bias, as the paper could selectively emphasise certain findings or overlook contradictory evidence.

Acknowledgements: Not applicable.

Funding Source: Not applicable.

Conflict of Interest: Not applicable.

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REVIEWS AND DISCUSSION PAPERS

An environmental scan of studies reporting current practices for the conduct of environmental scans

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ABSTRACT

Objective: The objective of this environmental scan is to synthesize the published, peer-reviewed literature specific to the term 'environmental scan' to determine how it is currently being used in health research and to propose some promising practices.

Background: Environmental scans are becoming increasingly popular in synthesizing information on emergent topics and describing practice and research scope. Despite the growing use of environmental scans in health research, including nursing and rehabilitation, limited attention is given to methodological best practices. It is essential that we develop knowledge in this area to assist researchers, trainees, healthcare professionals, educators, and decision-makers with the use and reporting of environmental scans.

Study design and methods: This environmental scan included a search of four health databases: CINAHL, Embase, MEDLINE, and PsycINFO. We included peer-reviewed studies published between 2000-2024 in English using two key terms, 'environmental scan' and 'health'. Studies were included that described methods used in conducting an environmental scan.

Results: We identified 56 studies describing methods for conducting environmental scans. A synthesis of these studies revealed four promising practices:
1) consider environmental/contextual influences,
2) use of multiple data sources and approaches,
3) engage stakeholders to ensure relevance/need and increase uptake, and
4) use of outcomes to address knowledge or service gap to optimise impact.

Conclusion: The findings of this environmental scan are among the first to examine methodological studies to determine promising practices for conducting environmental scans across health disciplines.

Implications for research, policy, and practice:
- The findings of this novel environmental scan are beneficial for health professionals, researchers, trainees, educators, and decision-makers in informing research, practice, and policy change

What is already known about the topic?
- The use of environmental scans is becoming increasingly popular in health research, including nursing and rehabilitation.
- There is a lack of consistency in the use and reporting of environmental scans across health disciplines.

What this paper adds
- This environmental scan is among the first to contribute foundational knowledge and innovation in promising best practices for the conduct of environmental scans in health research.
- The novel findings will assist in promoting consistency in the use and reporting of environmental scans.

Keywords: Environmental Scan; Health Professionals;Interdisciplinary Methods; Nursing Research; Rehabilitation Research; Research Design

OBJECTIVE

This environmental scan is an initial attempt to better understand the practices used in environmental scans. We invite others to join in furthering our understanding of best practices for environmental scans to advance its methodology. This environmental scan builds upon a scoping review conducted by Charlton and colleagues,[1] examining not only how environmental scans are being used in health research but goes a step further in using this information to invigorate discussion around 'promising practices' for their conduct given the apparent gap in the literature. We define promising practices as prevalent practices that seem to be commonly applied and were deemed by the expertise of our research team as methods worthy of future attention. Given our focus on methods, we specifically focused on published peer-reviewed literature to reflect what journals are accepting as environmental scans worthy of being published. While we recognise that this does not align with a traditional environmental scan approach, we felt this was an appropriate starting point. Our data extraction included information on purposes and promising practices common among the included studies for conducting environmental scans in health research. The outcome of this work is applicable to all health disciplines in promoting the consistent use and conduct of environmental scans.

BACKGROUND

In 1967, Francis Aguilar, a professor at Harvard Business School, coined the term 'environmental scan' to describe the action of observing and gathering data on competing companies and overall market performance in order to improve a company's output and performance.[2] The term environmental scan is frequently defined in the literature as:

> "the acquisition and use of information about events, trends, and relationships in an organization's external environment, the knowledge of which would assist management in planning the organization's future course of action"[3(p.1)]

Although environmental scans originated within a business context, there is increasing evidence for their value in health research to impact systemic and practice change.[4-6] Environmental scans have been conducted in various areas of health, such as nutrition, mental health, and women's health in determining the healthcare needs of individuals and communities.[4,7,8] The use of environmental scans in nursing and rehabilitation has increased considerably over the past two decades.[9-15] Despite the growing popularity of environmental scans in health research,[16] limited methodological support currently exists to conduct environmental scans.[3,17] Environmental scans can be useful in providing preliminary syntheses in areas in which a full systematic or scoping review is not yet justified.18 Systematic and scoping reviews have seen exponential growth, indicating an increasing desire to synthesize evidence.[19-21] Unlike systematic and scoping reviews which aim to synthesize and assess evidence in a given area, environmental scans often include alternate activities and evidence sources. Examples include reviewing organisational trends, integrating documentary material with interviews and surveys (mixed methods), and attempting to ascertain the 'pulse' or 'sense of things' of a group or organisation at the present moment rather than when papers were published.[7] Scoping reviews can be useful in describing the extent and range of a research area, however, fail to adequately 'scan' in the areas of organisation outputs and reports or other contextual features such as trends, availability of services, or understanding a system.[18] While scoping reviews often include grey literature, it can be a challenge to incorporate this type of evidence into these reviews. The environmental

scan could be a needed approach to better include these other types of information into a synthesis. Further, in the same manner in which the scoping review has significantly improved in its methodological conduct,[17,20] including reporting guidance the environmental scan could also benefit from methods attention.[12]

STUDY DESIGN AND METHODS

Our scan of environmental scans was specific to the context of 'health' and the term 'environmental scan' specifically. We were aware that a broader literature likely exists that would inform our questions (i.e., literature using these methods but not the term environmental scan) but we wanted to first do a summary specific to the term environmental scan to establish some foundational concepts to advance work in this area. We did this in order to focus our attention on papers that used the term environmental scan. In the absence of clear labelling and terminology in this field, this seemed to be the best approach at this stage. While we may have missed important papers, we can be sure that we have synthesized papers that are specific to environmental scans. A literature review of health research was conducted using four health databases: CINAHL, Embase, MEDLINE, and PsycINFO. The search used two key terms, 'environmental scan' and 'health'. Included studies met the following eligibility criteria: 1) an explicit description of the methods involved in conducting an environmental scan; 2) an environmental scan conducted in the context of health research; and 3) peer-reviewed, prevalent published studies in English between 2000-2024 to focus on current evidence. Two reviewers (TN, AE) screened all titles and abstracts independently prior to meeting to discuss final article inclusion. Three reviewers (TN, AE, BD) independently completed data extraction of included articles prior to meeting for discussion. Any discrepancies or disagreements between team members regarding data extraction or emergent themes around promising practices were resolved through consultation until consensus was achieved.

When our team embarked on this work, there was limited information on the methods for an environmental scan but since this is what we were aiming to advance, we opted to structure the paper like an environmental scan (as best as we could due to the new and emerging nature of the methods for environmental scans and without clear guidance to date) and were hoping this work would lead to better clarity. Given the infancy of methods for environmental scans, we did not adopt a particular theory or theoretical framework to guide our analysis as we did not want to direct what we found in any specific direction. Our team felt an inductive approach to data analysis was appropriate to understand how environmental scans are actually being done/reported rather than assuming there is one widely accepted way for its use. We extracted and synthesized the following data from the included studies: purpose and promising practices in conducting environmental scans. Thematic analysis was used to review the extracted data in each category and to ultimately synthesize the promising practices in conducting environmental scans among the included articles.

RESULTS

Fifty-six articles were charted for inclusion (see Appendix 1). We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines in documenting this work.[70] A supplementary file is provided to show the completed STROBE checklist in more detail [Supplementary File 1].

PURPOSES OF ENVIRONMENTAL SCANS

Environmental scans are readily used in health research to survey trends and needs for various individuals and communities in regard to the use, access, and availability of healthcare services and programmes.[7] Three themes emerged regarding the overarching purposes of environmental scans among the included studies.

- **Synthesize evidence to identify health and service gaps, trends, and needs:** A prevalent purpose of environmental scans among the included studies is identifying knowledge and service gaps, practice trends, and healthcare needs of individuals and communities to assess current services and to provide direction for health service planning and delivery.[1,4-7,13,16,,22,24,26,28,29,30,35-37,41,44,46-52,54,55,58,59,60,65,67,69]
- **Synthesize evidence to inform health research, practice, education, and policy: A**s reported in most of the included studies, another prominent purpose of environmental scans is reviewing, synthesizing, and assessing evidence (published and grey literature) to inform decision-making regarding the development of evidence-based solutions, interventions, patient decision aids, and strategies to facilitate health service planning and delivery, as well as health policy.[11,23,27,31-34,38-43,45,56,57,61,62,66,68] These evidence-based solutions, interventions, and strategies assist in advancing professional practice, education, and training.
- **Synthesize evidence to inform quality improvement:** As reported in a subset of the included studies, an important purpose of environment scan is reviewing, synthesizing, and assessing evidence to inform quality improvement in health services and programmes.[23,25,30,35,41,48,61,63,64] Importantly, the studies report on the need to develop actionable outcomes in addressing areas of improvement to impact change at a practice and policy level.

METHODS AND DATA SOURCES FOR CONDUCTING ENVIRONMENTAL SCANS

For clarity, the term 'methods' refers to the approach described in the included studies for conducting the environmental scan. Upon examination of the included studies, the general method involved in an environmental scan involves data collection from a variety of sources including literature reviews (systematic reviews,[23,30,31,34,38,39,41,42,44,50,59] scoping reviews,[1,5,28,43,53] etc.) of peer-reviewed and grey literature,[5,23] key informant interviews,[6,7,13,16,23-25,29,32,34,36,37,43-46,48,49,54,55,59,60,64-66] expert feedback/consultations,[5-7,26,31,41,42,53,63] online/internet materials and resources (Google search,[29-31] web-based resources,[40] social media networks Twitter and Facebook[30]), focus groups,[4,7,13,16] participant surveys,[7,16,22,32,47,51,52,54,56,61,68,69] practice observations,[13] memos and meeting minutes,[4] community resources,[4] personal communication (emails),[4] corporate/government data and resources,[4,6,32] and medical/health data and resources.[38,42] Most of the included studies used more than one data source (primary and secondary data sources) for comprehensiveness and credibility. It is worth mentioning that among the included studies, we found that the study by Wilburn, Vanderpool and Knight provided the most structured and concrete method by describing a seven-step approach for conducting environmental scans.[6] It is also important to highlight that a study by Rowel and colleagues encourages unconventional approaches or "out-of-the-box" thinking to conducting environmental scans to develop new knowledge and insight.[7]

DISCUSSION

The flexible nature of environmental scans promotes its wide use and rapid uptake across different disciplines; however, this flexibility poses challenges in consistent use and reporting among researchers, educators, and clinicians. Articles by Kassam,[40] Naumann, Reynolds, McColl, and Smith,[5] and Wilburn, Vanderpool, and Knight,[6] begin to outline a step-wise method for conducting environmental scans. Based on the findings of the included articles and the common components among them, coupled with our team's experiences and insights, our team came to a consensus to propose four promising practices for conducting environmental scans in health research.

1. CONSIDER ENVIRONMENTAL/CONTEXTUAL INFLUENCES

An essential component of environmental scans common among the included studies was the consideration of contextual influences on study outcomes. In comparison with other types of approaches to reviewing the literature (i.e., scoping reviews, systematic reviews, or narrative reviews), environmental scans not only synthesize information to assess the scope and trends in a given field but also the significance of contextual influences on outcomes.[8] The consideration of contextual factors is important in establishing relevant research questions and ultimately outcomes that are reflective of the unique needs of the target population.[7] For example, Reitmanova and Gustafson found that contextual factors such as cultural and religious differences, language and literacy issues, and mistrust of primary mental healthcare services, influenced access to mental health services for minority immigrants.[55]

2. USE MULTIPLE DATA SOURCES AND APPROACHES

The majority of the included studies used multiple data sources in the environmental scan to account for diverse forms of knowledge to strengthen and validate outcomes. Naumman and colleagues utilised multiple data sources and approaches to collect data for their scan on Fetal Alcohol Spectrum Disorder service availability in Eastern Ontario, which included internet searches, government and hospital websites, email, research registers, existing networks, and key informant interviews.[5] An important consideration outlined by Wilburn, Vanderpool, and Knight emphasises the importance of considering the variety of data sources for collecting information for the environmental scan as this may assist in preventing the omission of relevant and useful information.[6] The most common data sources used among the included studies include the use of literature reviews (systematic and scoping reviews), internet/online materials and resources, key informant interviews, and expert feedback/consultations. It is worth mentioning that we encourage researchers to be mindful of utilising online/internet data sources due to the dynamic nature of the internet, thus results are reflective of a specific point in time and determining a strategy to keep track of search results for future use would be helpful.

3. ENGAGE STAKEHOLDERS TO ENSURE RELEVANCE/NEED AND INCREASE UPTAKE OF OUTCOMES

A unique characteristic of environmental scans is ensuring the outcomes reflect societal needs, thus most of the included studies encouraged the engagement and participation of stakeholders to ensure the findings are reflective of the needs of citizens and communities. More specifically, early engagement of stakeholders was used to assist in assessing the feasibility, relevance, and impact of the environmental scan to enhance knowledge implementation. For example, in a study conducted by Liddy, Johnston, Irving et al, the research team established networks and connections with community health, social care organisations, and public health to facilitate the delivery of a self-management program.[43] These outreach and collaborative efforts enabled the translation of the program content into relevant, user-friendly, practical language and accessible format.[43] As environmental scans tend to assess the needs of stakeholders in each context, engagement in

the scan process may be critical in ensuring outcomes are specific and sensitive to the needs of the target population. The majority of the included studies engaged stakeholders in providing input as a data source for their scan. When stakeholders were not engaged the authors of the studies appeared to have expertise on their research team.

4. USE OF OUTCOMES TO ADDRESS KNOWLEDGE OR SERVICE GAP TO OPTIMISE IMPACT

An important component of environmental scans mentioned in most of the included studies is the consideration of how data will be analysed and disseminated. Given that the outcomes of environmental scans are often used to promote practice, policy and systems changes determining how study outcomes will be utilised to address specific knowledge or service gaps will impact research and practice change.[6,7,53] Therefore, a plan for the analysis, dissemination and implementation of environmental scan outcomes will assist in maximising impact.[4,7] Importantly, environmental scans also promote the creation of new knowledge that can result in actionable outcomes to inform practice change;[7] thus, results not only present an overview of the state of the literature but also a synthesis of new insight based on existing knowledge. A common thread among the included studies is the discussion of how outcomes will inform or impact change in research and practice. Based on our team's experience a distinguishing aspect of the environmental scan is a sense of urgency and consideration for the use of outcomes in addressing a knowledge or service gap. The timeframe from developing or assessing evidence to its use is expedited compared to other approaches.

STRENGTHS AND LIMITATIONS

This study is among the first to decipher promising practices in the conduct of environmental scans. A strength of this work is having the expertise of our collaborative interdisciplinary team (including a knowledge syntheses methodologist, health sociologist, knowledge translation researcher, implementation scientist, health services researcher, and expert in partnered research) with diverse perspectives and experiences in the conduct of environmental scans. The individual and collective experiences of team members contributed to identifying the promising practices and informed our selection of an environmental scan approach instead of a scoping or systematic review for this work. We acknowledge that this may present potential bias in the resulting four proposed promising practices. We encourage others interested in environmental scans to spark a conversation about how to standardise the methods involved in its conduct. One of the advantages of environmental scans is their flexibility thus, a standardised approach seems counterintuitive; making it difficult to outline a common or consistent procedure. Thus, this is an area for future consideration.

It is important to note that we used a scan method to investigate methods for environmental scans which may not have been optimal, however, it is a necessary and valuable first step in acquiring a sense of emerging common practices in the conduct of published environmental scans and validates that need for further research and attention into this type of 'scan' or review for methods. Since we focused on methods, we felt peer-reviewed published literature was the most appropriate data source to seek this information knowing that this would limit our findings as other work might have been missed and that other data sources would need to be considered to align with an environmental scan approach. We also acknowledge that in limiting our search using the terms 'environmental scan' and 'health', additional studies may have been missed.

CONCLUSION

Our findings suggest there is some consistency in the practice of conducting environmental scans due to the commonalities across the included studies. We have used literature that applies the environmental scan approach coupled with our team's experience and insights to provide four promising practices in the conduct of environmental scans. This work demonstrates the flexibility and value of environmental scans in health research. This work is among the first to provide an evidence-based description of key components that contribute to an environmental scan. However, our work provides a starting point and further research is needed to evaluate the effectiveness of the proposed components. Future work could focus on delineating between methods and data sources of environmental scans as this could be useful in guiding decision-making regarding the selection of data sources and the methods or procedures for collecting the data.

IMPLICATIONS FOR RESEARCH, POLICY, AND PRACTICE

We hope this work will encourage conversations among researchers, trainees, educators, scientific communities, and health professionals across health disciplines and beyond about establishing methodological best practices for environmental scans. The findings of this environmental scan are among the first to provide foundational knowledge regarding promising practices for the conduct of environmental scans in health research. We encourage other researchers and health professionals to build upon the findings of this work to establish formal or standard practices in the conduct of environmental scans.

Acknowledgements: We would like to thank and acknowledge the staff of the School of Rehabilitation at McMaster University for supporting this paper.

Funding Support: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. TN holds a 2021-2022 Fulbright Canada Chair in Arctic Studies. IDG is a CIHR Foundation Grant recipient (FDN #143237).

Declaration of conflicting interests: The authors have no conflict of interest to declare.

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