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ORIGINAL ARTICLE

Strategies to support pressure injury best practices by the inter-professional team: A systematic review

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Optimal pressure injury (ulcer) management by the inter-professional team requires appropriate health care system and organisational resources, infrastructure, and policies. A systematic review was conducted on pressure injury care-related education and health care system-/organisation-level strategies. A search for relevant articles published between January 2006 and October 2014 was applied to 8 databases. Ultimately, 22 articles pertaining to education and training and 12 articles pertaining to health care system and organisation supports for pressure injury care were included in the systematic review. A lack of pressure injury assessment and management knowledge by health care professionals was an overriding theme in the education literature. Some of the methods preferred for pressure injury education among nurses and physicians included information technology (eg, e-learning) with technology support and the use of high-quality wound pictures. Although the evidence is scarce, the literature did highlight specific system- and organisation-level barriers and enablers that influence practice change, including inter-professional communication and human resource investments. In conclusion, (1) the current evidence on the education and system-level enablers, barriers, and strategies to optimise pressure injury best practices requires further investigation, and (2) multi-faceted, up-stream, evidence-based approaches for pressure injury care are essential to improve health care and patient-related outcomes.

KEYWORDS

education, health system, organisation, policy, pressure injury (ulcer)

1 | INTRODUCTION

A pressure injury (PI), also known as a pressure ulcer, is defined as "localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities and condition of the soft tissue."[1]

PIs impact many individuals. Between 2010 and 2013, the overall prevalence of PIs among residents in Ontario who were admitted to acute care, home care, long-term care, or continuing care was approximately 13%, with the highest prevalence occurring in the complex continuing care setting.[2] In addition, about 25% of the residents in long-term care developed a PI 1 week after discharge from an acute care hospital.[2] Overall, the development of PIs has been linked to prolonged hospital stays, decreased levels of functioning, and high mortality.[3,4] The burden of PIs on individuals' health-related quality of life is also substantial. Individuals with PIs are more likely to experience social isolation, loss of

independence, depression, pain, and recurrent infection.[5,6] Moreover, the economic burden of PIs on the health care system is high. In Canada, Chan et al[7] estimated a monthly cost of $4750 (Canadian) for every person with a spinal cord injury who was receiving PI care in Ontario in his or her community. Clarke et al[8] estimated that treatment costs for a single PI can range from $10 000 to $86 000 (US dollars) (with a median cost of $27 000) and that treating PIs can increase nursing time by up to 50%.

There is a plethora of research on the clinical management and treatment of PIs. Moreover, there is evidence to suggest that wound care best practices are ideally delivered by an inter-professional team (IPT) (eg, nurse, physician, dietician, physical therapist, occupational therapist, etc.).[9] However, the literature is scarce on how PI best practices delivered by the IPT can be effectively implemented in clinical settings. According to the Registered Nurses' Association of Ontario's (RNAO)[10] Knowledge-to-Action Framework, the identification of the enablers, barriers, and strategies needed to convert evidence to clinical practice play a significant role in improving health care and patient-related outcomes. Thus, a systematic review of the literature was conducted to identify the enablers, barriers, and strategies to the education and health care system/organisation-level supports for the implementation of PI best practices in health care.

The aim of the paper is to review the evidence, contextual factors, and facilitation supports needed to promote PI best practices delivered by the IPT.

The specific objectives of this paper are to:

1. Identify the educational barriers, enablers, and strategies to supporting PI care by the IPT.
2. Assess the organisational- and system-level barriers, enablers, and strategies to supporting PI care by the IPT.
3. Delineate future research priorities based on knowledge gaps and issues identified in the systematic review.

Key Messages

- optimal inter-professional pressure injury (PI) care is influenced by contextual factors and multi-level knowledge translation strategies
- the aim of the systematic review was to identify clinical setting-related education, system- and organisation-level enablers, and barriers and strategies that influence the uptake of PI best practices in the clinical setting
- nurses and other health care providers demonstrated a lack of knowledge of PI management, with multiple education strategies identified in the literature to enhance PI knowledge
- multiple system- and organisation-level enablers and barriers have been identified in the literature; however, strategies directed at mitigating barriers and leveraging the enablers to facilitate PI best practices require further investigation

2 | METHODS

A systematic review was completed using a comprehensive search strategy that captured literature from January 2006 to October 2014. Two research questions were developed to identify the education and organisation-/system-level enablers, barriers, and effective strategies to implement PI best practices in clinical care by the IPT.

Electronic searches were performed by an expert librarian in the following databases: Cumulative Index to Nursing and Allied Health (CINAHL), Cochrane Controlled Trials (CT), Cochrane Systematic Reviews (SR), Database of Abstracts of Reviews of Effectiveness (DARE), Embase, ERIC, MEDLINE, and PsycINFO. The key terms searched included: pressure ulcer; pressure injury; pressure sore; bed sore; decubitus ulcers; education; continuing education; continuing education provider; interdisciplinary education; curriculum; curriculum development; clinical education; nursing education; learning; refresher course; in-service training; vocational education; professional development; teaching hospital; teaching round; teaching; videoconferencing; webcast; policy; health care policy; hospital policy; organizational structure; health care delivery; integrated health care system; health care quality; decision making; decision support system; health economics; health care cost; health care financing; cost; economic evaluation; community care; patient care planning; health care planning; strategic planning; funding. A representative panel of subject matter experts (physician, registered nurses, registered practical nurse, nursing student, nurse practitioners, nursing professors, registered dietician, enterostomal therapist, occupational therapist, physical therapist, and patient representative) were also asked to review their personal libraries and identify key articles for inclusion in the systematic review.

Two masters-prepared nursing research associates (NRAs) with training in systematic review methodology independently screened each title and abstract against prespecified eligibility criteria. General inclusion criteria included: research articles published between 2006 and 2014; a focus on PIs in adults older than 18 years; within the scope of the IPT (ie, regulated health care professionals); written in English; and all study designs. Research articles were excluded if they were not written in English; unpublished, that is, grey literature; outside the time frame; articles with a minimal focus on PIs; expert reports; white papers; consensus documents; discussion papers; case studies; guidelines; papers without research methodology; and studies involving animals. In addition, research articles were included if they primarily focused on PI education (ie, undergraduate, graduate, and health care professional training) for the nurse and/or the IPT or any organisation-/system-level policies and other supports needed to facilitate

best practices in PI care. Discrepancies and disagreements between the NRAs during the initial review of titles and abstracts were resolved by a masters-prepared guideline development lead. Full-text cited articles included at the initial review (ie, title and abstract screen) were reviewed for further relevance against the pre-specified eligibility criteria.

The research articles that passed the eligibility criteria were quality-appraised using tools from the Critical Appraisal Skills Programme (CASP) and Assessing the Methodological Quality of Systematic Reviews (AMSTAR). Each study was scored, rounded when necessary, and given an overall score of Strong (achieving >85%), Moderate (achieving 65-80%), or Weak (achieving <65%) based on their methodological quality. Two NRAs quality-appraised the final research articles for the systematic review. Inter-rater agreement between the 2 NRAs was satisfactory at kappa = 0.706.

Due to the heterogeneity of the literature, the authors conducted a content analysis. A content analysis refers to a research method wherein the phenomena under study are systematically reviewed to derive meaning and conclusions from the data.[11] The 4 major steps in a content analysis are: (1) decontextualisation, (2) recontextualisation, (3) categorisation, and (4) compilation. First, the authors familiarised themselves with the data.[11] As such, relevant information was extracted from selected papers using a standardised data extraction form to document the names of the authors, the purpose of the study, types of participants, research methods used, study setting, outcome and assessment details, authors' conclusion, and implications to practice. Second, at least 2 reviewers conducted an independent review of the systematic review results to identify the meaning of units embedded in the education and health system-/organisation-level literature.[11] Thereafter, a summary of key findings were compiled into a topic matrix to allow for easy comparison by topic and by strength of evidence. Third, the authors discussed and came to a consensus on the major themes.[11] Fourth, a summary of the implementation themes for PI best practices that emerged from the systematic review are presented in this paper, followed by a discussion of the enablers, barriers, and strategies identified in the literature. The implications of the systematic review findings for future research and clinical practice are also discussed.[11]

3 | RESULTS

3.1 | General characteristics and methodological details: education and training

For the research question related to education and training, a total of 3728 records were returned from the search, and 418 were removed as duplicates. From the 3310 unique articles, 3362 records were excluded based on a review of the titles or abstracts. Following this stage, the full texts of 48 articles were reviewed, and 22 articles met the inclusion criteria. See Figure 1 (PRISMA Diagram).

Over half of the studies were published in 2010 or after ($n = 15$), and the settings of the studies varied extensively. Of the 22 studies, 10 were conducted in hospital settings and 2 were in academic institutions. Three studies each were based in Iran ($n = 3$), the United Kingdom ($n = 3$), and the United States ($n = 3$), and there were 2 studies each based in Turkey ($n = 2$), Australia ($n = 2$), Jordan ($n = 2$), and Spain ($n = 2$). A majority of studies sampled nurses ($n = 15$); however, there were 3 studies that sampled students, 2 studies that did not specify a sample, and 1 study that sampled both registered nurses and students, and another that sampled more than 1 professional group.

Most of the studies used a cross-sectional ($n = 12$) design, followed by quasi-experimental ($n = 3$), randomised control trial ($n = 3$), qualitative ($n = 2$), mixed methods ($n = 1$) and pre-post ($n = 1$) study designs. Over 60% ($n = 14$) of the studies were scored as having moderate methodological quality, 5 were of weak methodological quality, and 2 were strong. Among the cross-sectional studies, common areas of concern that contributed to studies being scored low include inadequate descriptions of or weak approaches to: recruitment of participants, use of measures that remove bias, and method of data collection. The 5 weak studies were further excluded from the content analysis, resulting in 17 papers of strong to moderate strength.

3.2 | General characteristics and methodological details: system, organisation, and policy

The literature search for the organisation- and system-level research question generated a total of 6347 records. After removing duplicates, the titles and abstracts of 5194 were reviewed, and 47 were selected for full-text review. Of these, 12 met the inclusion criteria. See Figure 2 (PRISMA Diagram). Over half of the studies were published in 2010 or after ($n = 7$). Half the articles were conducted in nursing homes or long-term care facilities, with 3 studies based in Canada, including 2 in Ontario. There were 2 studies each that were based in the United States ($n = 2$) and the Netherlands ($n = 2$) with varied settings.

The most common study design used was cross-sectional study ($n = 5$), followed by qualitative ($n = 3$) and cohort ($n = 2$) studies. There was also 1 randomised control trial and 1 systematic review included in the organisation and policy research question. Half of the articles were of moderate methodological quality ($n = 6$); 4 were scored as strong and 2 were scored as weak quality. Among the cross-sectional studies, common areas of concern that contributed to studies being scored low include inadequate methodological descriptions or weak approaches to: use of measures that remove bias and method of data collection. Among the qualitative study designs, the area that was of concern was the use of appropriate data collection methods and the lack of adequate consideration of the relationship between researcher and participants. Due to the scarcity of

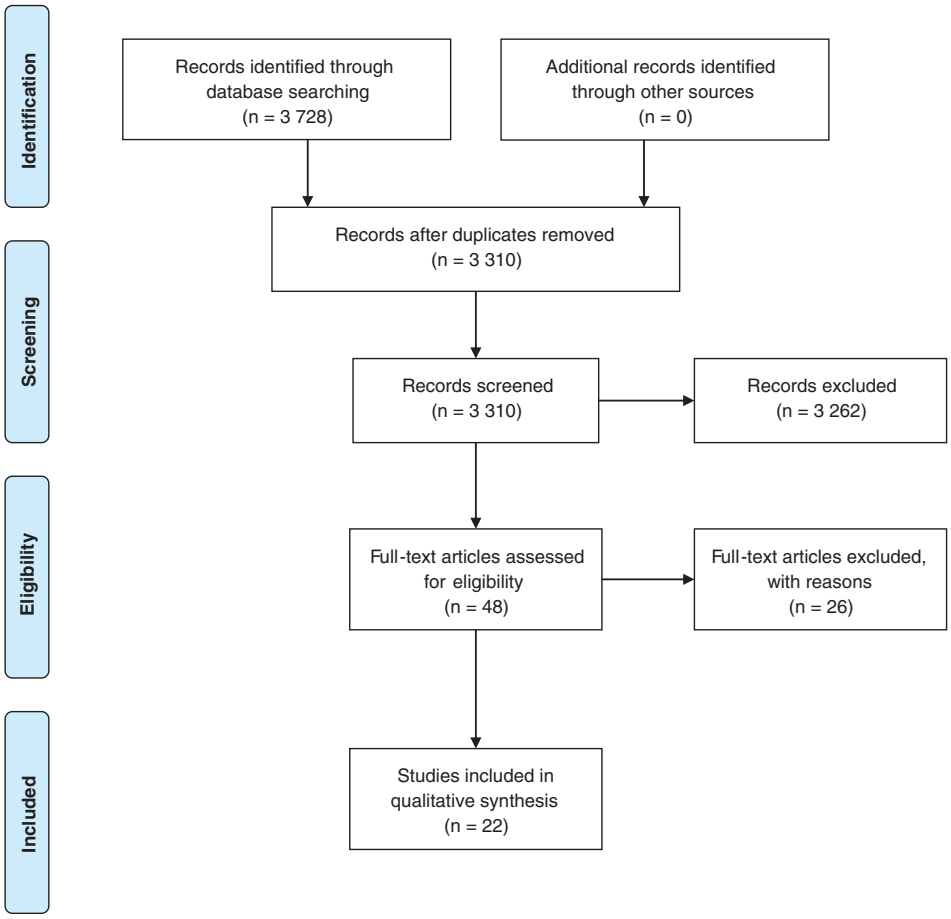

FIGURE 1 PRISMA 2009 flow diagram for education and training

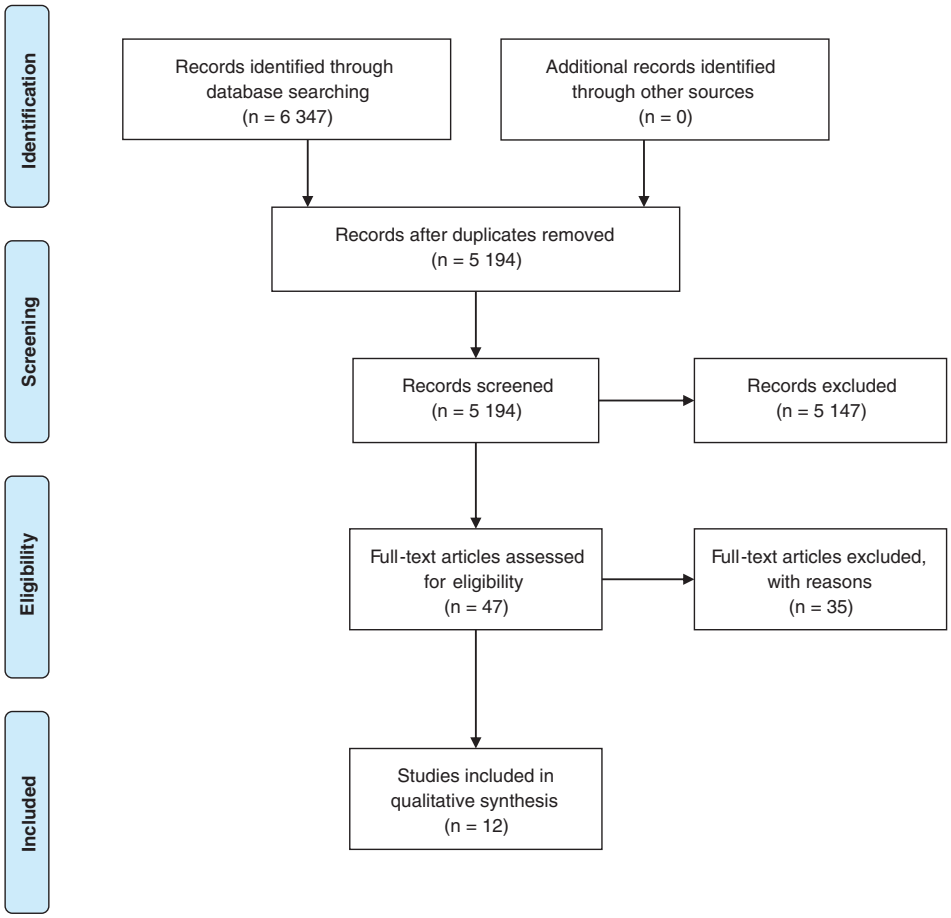

FIGURE 2 PRISMA 2009 flow diagram for system and organisation

the literature for this research question, all studies were included in the content analysis.

3.3 | Content analysis of education systematic review

Of the 22 articles identified for the research question on education, 17 studies were included in the content analysis. Five studies were excluded from the analysis because of their high risk of bias (ie, quality appraisal was weak). The major themes identified in the systematic review were: nurses' lack of knowledge on PI prevention and management; multiple methods of educational strategies improve nurses' knowledge of PI management; education improves nurse's confidence and competence in PI management; unclear role of clinical experience related to knowledge of PI prevention and treatment; and the implementation of PI best practices is impacted by multiple factors.

3.3.1 | Lack of knowledge in PI prevention and management

Twelve strong- or moderate-quality studies examined provider knowledge with various survey tools to examine a number of aspects of PI care, including prevention and management. Most study participants included nurses working in hospitals. Five studies used the 47-item Pieper's Pressure Ulcer Knowledge Test (PPUKT) to evaluate health care providers' knowledge of PI prevention, staging, and wound description.[12–16] The percentage of correct responses on the PPUKT ranged from 54.36% to 70.1%; however, the majority of the studies concluded that health care providers (ie, mainly nurses) lacked PI care-related knowledge.

Of the remaining studies, researchers either used an adaptation of the PPUKT or developed their own survey tool. While there was variation between studies, the need for improvement in health care providers' knowledge on PI prevention, management, and/or implementation was apparent in these studies. Two studies explicitly concluded a general lack of knowledge among study participants,[17,18] and other studies focused on specific outcomes and/or type of practitioners. Specific results included:

- Nurses and general physicians (GP) working in the primary health care setting and residential aged facilities had the highest needs for wound management education and training.[19]
- Nurses in the diploma programme reported receiving more hours of formal clinical teaching than nurses in the degree programme.[20]
- Significant gaps in core knowledge in the areas of PI prevention and management were identified among physicians and nurses. Doctors scored better than nurses in PI prevention, and nurses scored better than doctors in PI management.[21]
- PI prevention interventions are better known and more frequently implemented than PI treatment interventions among the licensed practical nurse (LPN) group compared with the registered nurse (RN) group. However, it is important to note that LPNs did not provide PI treatment as it was beyond their scope of practice.[22]
- Participants in the e-learning intervention group acquired a better ability to evaluate PIs compared with those who received traditional lecture-style learning.[23]
- Work setting (inpatient vs outpatient, special outpatient, maternity) affected nurses' knowledge of PI, with nurses working in an inpatient setting demonstrating more knowledge compared with nurses working in an outpatient, special outpatient, or maternity setting.[16]

3.3.2 | Multiple methods of educational strategies improve nurses' knowledge of PI management

Five strong- or moderate-quality studies explored specific educational interventions to improve PI knowledge. An in-person teaching modality was used in 1 study,[24] while 2 studies utilised an online/e-learning format.[23,25] In relation to study findings, 1 study concluded that participants in the e-learning intervention group acquired a better ability to evaluate PIs compared with those who received traditional lecture-style learning.[23] All online modalities involved independent review of learning content.

Zulkowski, Ayello[26] studied the impact of wound care certification and education on nursing knowledge among a sample of nurses in urban and rural areas of the United States. Nurses certified as wound specialists demonstrated significantly higher scores on the PPUKT compared with nurses with other non-wound care-related certification and individuals without certification. In addition to higher scores on the PPUKT, nurses certified in wound care reported participating in a variety of continuing education activities.

The education content also varied among studies and included: photographs[24,25] and the assessment and treatment of PIs.[23] As such, the outcome measures also varied among studies, but the most common outcome measure assessed was the correct classification of PIs.[23–25] Positive findings were noted among two randomised control trials and a pre-post study that examined the impact of educational interventions on the correct classification of PIs post-education.[23–25] Among participants in the experimental group, Beeckman[24] also noted a statistically significant difference in the skill of differentiating incontinence-associated dermatitis and PIs. Beeckman, Schoonhoven[25] was the only study where classification skills improved in both the experimental and control group.

Another study examined participant experiences with a national nursing quality indicator PI training programme.[27] The programme consisted of 4 modules on different topics related to PI identification and staging and 3 tests. Study findings revealed that participants valued: high-quality photos of PIs during training with short narrative descriptions next to the picture; accurate, clear, and relevant information; and technology-facilitated learning (eg, ability to

get immediate feedback, flexibility with reviewing module content).[27] While the previously mentioned components enhanced the educational experience of participants, there were barriers to participants' satisfaction related to clarity of content, programme design, and technological problems. Despite these barriers, Bergquist-Beringer, Davidson[27] concluded that their educational programme was effective in educating staff nurses about PI identification and staging.

3.3.3 | PI education increases confidence and competence in PI management

One moderate-quality study in the United Kingdom explored the attitudes of pre-registration nursing students concerning their perceived skills of managing patients' skin integrity effectively on registration. In relation to preparedness to undertake clinical procedures, diploma nurses were more likely to feel confident and competent than their undergraduate counterparts despite spending the same amount of time with mentors and peers.[20]

3.3.4 | Role of clinical experience on knowledge of PI prevention and treatment is unclear

The current evidence is unclear with respect to the impact of clinical experience on health care providers' knowledge of PI prevention and treatment. Overall, 3 studies concluded that clinical experience does not influence PI knowledge, whereas another 3 studies determined that clinical experience does improve knowledge of PI prevention and treatment. One moderate-quality study demonstrated that years of clinical experience/training did not positively influence PI knowledge among physicians and RNs.[21] Moreover, there was no significant difference in the overall mean PI knowledge scores between doctors and nurses combined.[21] A second moderate-quality study did not show any relation between years of experience and PI knowledge among orthopaedic RNs,[15] whilst a third strong-quality study concluded that years of experience negatively affected health care providers' knowledge of PI care.[16] However, in another 3 studies, clinical experience improved health care providers' knowledge of PI care,[17] impacted the delivery of PI treatment but not PI prevention,[28] or clinical experience in PI research improved health care providers' knowledge of PI prevention and treatment.[22] These 3 studies were also of strong[28] or moderate methodological quality[17,22].

3.3.5 | Implementation of PI best practices is impacted by multiple factors

According to 2 studies, the implementation of PI best practices is influenced by multiple factors other than health care provider knowledge, including access to risk assessment tools and a PI grading system, type of facility, and higher education. In 1 strong-quality study, a range of education programmes combined with health care provider access to risk assessment tools and a PI grading system were shown to positively impact the implementation of PI prevention and treatment strategies by the IPT.[28] This study also indicated that the implementation of PI best practices is impacted by the location of practice, with significantly higher levels of PI implementation occurring in teaching and private hospitals compared with government and military hospitals.[28] In addition, higher education was correlated with the delivery of PI prevention strategies but not PI treatment.[28] It is important to note that multiple barriers to PI implementation were also identified in a moderate-quality study including a heavy patient workload, staff shortages, lack of equipment, and a lack of in-service training.[18]

3.4 | Content analysis: system-, organisation-, and policy-level systematic review

In total, 12 studies were included in the systematic review for this research question. The 2 methodologically weak studies were included in the content analysis because of the scarcity of literature on the system-, organisation- and policy-level strategies and supports for best practices in PI care. The major themes identified in the systematic review were: team-based approaches to PI care; importance of communication between nurses and physicians; identification of barriers and enablers to guideline implementation; evaluation of implementation strategies; and the influence of staffing on the incidence and prevalence of PIs.

3.4.1 | Team-based approaches to PI care

From the evidence included, 2 studies explored the use of a team-based approach to delivering PI care in the long-term care sector. A moderate-quality study by Stern, Mitsakakis[29] explored the use of enhanced multidisciplinary teams in long-term care facilities from 2 Ontario Local Health Integrated Networks. The teams with appointed wound care leads (RN or RNs) also had the resource of an advanced-practice nurses who provided outreach to long-term care facilities, including educating staff on the prevention and treatment of PIs and the ability to consult with a hospital-based expert wound care team via email, telephone, or video link. Similarly, a weak-quality study by Lynn, West[30] assembled a quality improvement team in nursing homes in a District of Columbia, but the authors did not provide details on the composition of the team. In both studies, the function of a team-based approach to pressure injury care was facilitated by education and training for team members.

The outcomes of interest were different in both studies as the Stern, Mitsakakis[29] study's primary outcome measured the rate of reduction in PI surface area, and Lynn, West's[30] study was primarily focused on analysing the incidence and prevalence rates of stage II to IV PIs. Although Stern, Mitsakakis[29] concluded there was no difference in the primary or secondary study outcomes with the use of a multidisciplinary team, an economic evaluation of the team did demonstrate a decrease in direct care costs when compared with usual care. Furthermore, findings from the

qualitative component of the study revealed that the use of advanced practice nurses in the multidisciplinary team was not only valued but also contributed to reduced cost. On the other hand, Lynn, West[30] suggested that a quality improvement team can reduce the incidence of stage III to IV lesions. The study also concluded that the incidence of stage II lesions may not correlate with the incidence of stage III to IV lesions.

3.4.2 | Importance of communication between nurses and physicians

Only one moderate-quality cross-sectional study reported on nurse and physicians communication in relation to patients' outcomes in 25 intensive care units in Michigan. The study concluded that as the efficiency of communication between nurses and physicians improved, the prevalence of PIs decreased.[31] It is important to note that this finding was not statistically significant.

3.4.3 | Identification of barriers and enablers (facilitators) to guideline implementation

Three studies, ranging from weak to strong methodological quality, explored guideline implementation in relation to the care of PIs in this systematic review. Settings of guideline implementation included: 22 acute community and long-term care settings in Ontario,[32] 2 Swedish hospitals and community care,[33] and 7 long-term care facilities in Saskatchewan.[34] Timmerman, Teare[34] implemented the Saskatchewan Pressure Ulcer Guidelines, while Ploeg, Davies[32] explored the implementation of 9 different guidelines from the Registered Nurses' Association of Ontario (including the 2007 version of the Assessment and Management of Stage I to IV Pressure Ulcers guideline). While Athlin, Idvall[33] did not implement a specific guideline, the study aimed to describe contributing factors for the progression or regression of PIs in the care trajectory as they were understood by nurses working in hospitals or community care.

From the studies identified, 3 studies explored barriers to guideline implementation, 1 explored facilitators, and only 1 study explored the effectiveness of guideline implementation. Elements that were cited as barriers by more than 1 study include: lack of time[32–34]; lack of resources,[32,34] views, and values of healthcare professionals[32,33]; and healthcare professional cooperation.[33,34] Other barriers that were less commonly mentioned include: lack of routines, lack of use of guidelines and routines for the assessment and treatment of PIs and lack of personnel,[33] organisational- and system-level change, and limited integration of guideline recommendations into organisational structures and processes.[32]

A strong-quality study by Ploeg, Davies[32] was the only study that explored facilitators to guideline implementation. Factors that were cited as facilitators by Ploeg, Davies[32] include: learning about the guideline through group interaction, positive staff attitudes and beliefs, leadership support, presence of champions, teamwork and collaboration, support from a professional association, and inter-organisational collaboration and networks. It was interesting to note that while Ploeg, Davies[32] noted the presence of the aforementioned factors as supports for guideline implementation, some of these factors were also mentioned as barriers. This might suggest that the presence or absence of certain factors can be a facilitator or barrier, respectively.

The findings above suggest that organisations must be aware of the various facilitators and barriers that may influence the implementation of guidelines. Interestingly, a weak-quality study conducted by Timmerman, Teare[34] was the only study that explored clinical outcomes while implementing a guideline. Study findings revealed that while the monthly *incidence* of residents with PIs decreased, *prevalence* increased during the beginning of the study period and then continued to decrease until the end of the project.[34]

3.4.4 | Evaluation of implementation strategies

While there was only 1 study that explored the effectiveness of guideline implementation, part of the issue may be explained by another 2 studies that evaluated the effectiveness of guideline implementation strategies. Interestingly, both studies used the Rogers' model of innovation-decision process as a framework to guide the analysis of the study findings.[35,36] Findings from a moderate-quality study by Meijers, Schols[35] revealed that while the European Pressure Ulcer Advisory Panel's guideline on nutrition in PI prevention and management was well disseminated in the Netherlands and UK, and although many professionals were aware of the guideline and were positive towards guidelines, it did not appear that the majority of participants were applying the guidelines to their daily practice. Meijers, Schols[35] concluded that despite the factors mentioned above, a lack of knowledge and skills among respondents appeared to be the main barrier to the provision of nutritional support. In a moderate-quality study by Meesterberends, Halfens,[36] all participants reported reading PI guidelines, had positive attitudes towards it, and stated that they applied the content to their daily practice. On the contrary, the findings revealed that PI implementation was not successful in all Dutch nursing homes.[36] Both studies suggest that while attitudes towards the use of PI guidelines are positive, the uptake of recommendations in everyday practice is poor.

3.4.5 | Influence of staffing on the incidence and prevalence of PIs

Four studies explored the impact of staffing on the incidence and prevalence of PIs, of which 3 found a relationship, and 1 study highlighted mixed results. A strong-quality study by Liu, Lee[37] concluded that the odds ratio for patients who developed PIs increased with the patient-nurse ratio in Taiwan. Similarly, data from 2 nationally representative databases from the United States identified that, in nursing homes with high numbers of certified nursing assistants,

turnover was associated with higher rates of low-risk PIs compared with those with lower turnover rates.[38] It is important to note that in this strong-quality study, this relationship was no longer significant after adjusting for staffing, skill mix, bed size, and ownership.[38] A moderate-quality systematic review also noted a lack of evidence for a relationship between nurse staffing levels and quality of care, although, in general, higher staffing levels were associated with a decrease in PI prevalence.[39] However, this systematic review did contain mixed findings as there was 1 study that reported that more nursing staff were associated with an increase in PI prevalence.[39] And lastly, 1 strong-quality study explored the impact of various structural and staffing characteristics on 9 quality indicators, with the prevalence of PIs as 1 of the quality indicators.[40] This study identified that when the medical staff organisation dimensions were added into a regression model after controlling for nursing home structural characteristics, near-significant findings were noted for the prevalence of PIs.[40]

4 | DISCUSSION

Overall, strategies directed at education- and organisation-level enablers and barriers in clinical care are important to the successful implementation of PI best practices. Upstream, evidence-based, multi-faceted strategies are key to ultimately influencing IPT behavioural change and patient PI-related outcomes.

4.1 | Education: enablers, barriers, and strategies for PI implementation

According to RNAO's Knowledge-to-Action framework, the identification of enablers, barriers, and strategies for implementation are important to the successful transfer of knowledge to clinical practice.[10] The review and content analysis of the 17 research papers on PI prevention and treatment related to education and training identified several clinical practice enablers, barriers, and strategies needed for the successful implementation of IPT.

Based on the review of the literature, the authors propose education strategies to improve the implementation of PI best practices by the IPT. There is a particular need to focus on PI education in primary and long-term care, where the knowledge on PI prevention and management among health care providers (ie, physicians and nurses) is particularly lacking.[19] Various PI prevention and treatment-related education strategies were identified in the literature to improve health care provider knowledge, including e-learning linked to technical support and lecture programmes along with reading and study days on PI prevention and treatment.[19,24–27] Health care providers learn in differing ways, and therefore, education needs to be provided with varied methods to meet diverse learning needs.[23,28] Moreover, the evidence states that PI education content needs to be clinically relevant to the practice settings and incorporate high-quality photos to enhance learning[27] with access to additional resources, including risk assessment tools, PI staging/grading systems, and equipment (ie, support surfaces[18]). The authors recommend that all PI education be developed using multi-faceted approaches and delivered from an IPT perspective. In addition, the authors believe that PI education should be mandatory at orientation and on a yearly basis, similar to fire safety, hand washing, and Workplace Hazardous Materials Information System (WHMIS) training in most Ontario organisations. It is recommended that organisations facilitate clinical mentorship with inter-professional wound care experts in order for new graduates and clinicians inexperienced in the care of people with PI to further develop their knowledge and skills in PI best practices. Similarly, it is recommended that students at the undergraduate- and at entry-level programmes have clinical hours mandated for PI prevention and treatment. Organisations also need to support certification or higher education in wound care to develop in-house expertise on PI prevention and management.

4.2 | Healthcare and organisation system: enablers, barriers, and strategies for PI implementation

The review and content analysis of 12 PI research papers identified a number of system- and organisation-level enablers, barriers, and strategies that influence the successful clinical implementation of IPT in PI care. Implementing research into clinical practice requires a concerted effort to address organisational and system factors rather than a focus on individual characteristics. The findings of this review are consistent with the approaches to translating knowledge into practice described by existing frameworks in the literature, including RNAO's Knowledge-to-Action Framework.

Several enablers were identified in the literature. Communication is an important tool to share values and raise awareness germane to PI care. Through frequent, timely, and coordinated communication, the organisation can be more efficient in managing clinical concerns. One study by Manojlovich, Antonakos, and Ronis[31] identified the importance of communication between nurses and physicians, although the desired method of interaction remained unanswered. While having positive staff attitudes and beliefs towards practice change was acknowledged as an enabling factor, an attitude shift in itself did not always lead to behavioural change.[9,32] Fostering a culture of change is an enormous task, and leadership in terms of creating and sustaining a PI team, developing champions, and providing point of care guidance with reminders is needed to facilitate practice change.[29,32,41]

Several barriers were also identified in the literature. One of the most commonly perceived barriers is that the implementation of best practices requires the investment of substantial time and effort.[18,34] Other identified barriers included the lack of existing structures and knowledge

brokers crucial to successful guideline adoption and implementation.[32]

Overall, there is no 1 strategy that enhances and secures successful and sustainable guideline implementation. Thus, the authors recommend that it is prudent to incorporate multiple, upstream implementation strategies by using technologies, providing leadership, and building teams.

4.3 | Strengths, limitations and implications for future research

One of the key strengths of the systematic literature review was that it was conducted with methodological rigour. First, a comprehensive search strategy spanning 9 years of literature and informed by a health sciences librarian, NRAs trained in systematic review methodology, and an expert panel was executed in several standard research databases. Second, two masters-prepared NRAs independently screened the evidence to determine the final research articles for inclusion in the systematic review.

The findings of this systematic review should be interpreted within the context of some limitations. There is a potential for publication bias as no structured search of the grey literature was conducted, and only articles published in English were included. Although a smaller number of articles were ultimately included in the final systematic review, a plethora of literature was screened to seek answers to the research questions.

A number of research gaps in the literature were also identified by the authors. Most notably, there is a lack of evidence on how to best engage the IPT to effectively acquire the education and knowledge to support sustained PI best practices in clinical care.[42] There is also insufficient information in the studies reviewed in this systematic review to relate educational programme design to the education evidence base as outlined in the Cochrane educational database.[42] Finally, more research is needed to determine the effectiveness of multi-faceted strategies targeted at the system- and organisation-level barriers identified in the literature to create behavioural change and a shift in organisational culture and promote positive health care and patient-related outcomes in PI care.

5 | CONCLUSION

According to existing knowledge translation models, such as RNAO's Knowledge-to-Action framework, multiple strategies are required to support clinical practice change. Thus, to optimise the translation of best practices in PI care in the clinical setting, the analysis of a systematic review to identify the educational-, organisational-, and system-level barriers, enablers, and strategies to support PI care by the IPT was conducted. The systematic review results indicate that a lack of PI health care professional PI knowledge is a barrier to effective PI care. There are also many system- and organisation-level barriers that need to be corrected to create a positive shift in clinical practice. The authors conclude that more research is needed to identify effective multi-faceted strategies to address the barriers and support the enablers to implement best PI-related clinical practices.

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