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Senior Nurses Can Support New Graduates in Developing Practice Readiness

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Long-time readers of this journal likely remember the regular publication of feature articles and columns addressing the transition to professional practice for new graduate nurses. Supporting new graduates is probably the most sacred responsibility of senior nurses, whether they have practiced for 2 or 32 years. We need to ensure our new colleagues receive not only a warm welcome to nursing practice but also an excellent preparation for assuming the caregiver role in all its facets.

In their scoping review in this issue, Dohm and Prochnow suggested senior nurses carefully attend to new graduates' psychomotor skills as part of their transition to professional practice. As authors noted, these skills are often taught to students early in the nursing curriculum and may not be revisited to any great degree in later semesters. Clinical skills practice for students is limited at best. In my basic education many years ago, I had one opportunity to perform urinary catheterization. Many of my classmates graduated with no such clinical experience. Practice opportunities have been impacted particularly in recent years by the COVID pandemic, when students either could not go to clinical settings or had very limited contact with patients due to restrictions.

Along with psychomotor skills, new graduate nurses need opportunities to develop their critical thinking. While many strategies have been suggested to help graduates improve their critical thinking ability, a recent quality improvement project used journaling as an innovative option (Guynn, 2024). The six new graduates in this project completed reflective journaling weekly for their 6-week orientation program. Before and after the orientation, they also completed the *Health Sciences Reasoning Test*. While there was no significant difference in total test scores before and after the journaling intervention, the author found a strongly positive and significant correlation between graduates' baseline and post-journaling scores in the deduction domain of clinical reasoning. She recommended additional research on this intervention, but it seems to be a highly feasible option to use in transition to practice programs.

We know the lack of in-depth preparation affects students' adjustment to the professional work environment (Gregg et al., 2023). Support exists in many settings through nurse residency or transition programs. However, new graduates often are expected to develop appropriate behaviors and attitudes on their own. Just how good are we as a profession at helping new graduates affirm and practice the skills they need to be safe, effective nurses? What are our expectations of new graduate nurses and how well do we communicate those expectations? Gregg and co-authors explored senior nurses' expectations in their qualitative study, identifying six themes: "trying to fit in with people in their ward, behaving by following the unspoken rules of their ward, having attitudes compatible with learning, addressing their situations using their initiative, showing a willingness to learn, and obtaining necessary information by themselves" (p. 1). They suggested these expectations be clearly communicated to new graduates to set the stage for the transition experience. Attitudinal support is just as important as technical skills verification because new nurses leave the profession at an alarming rate.

Actions of senior nurses are vital to helping new graduate nurses not only practice technical skills safely but also succeed in adapting themselves to the professional role on all levels. We must help our new colleagues develop practice readiness so they remain with us in the profession we love. MSN

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Journal Mission Statement

MEDSURG Nursing is a scholarly, peer-reviewed journal dedicated to advancing evidence-based medical-surgical nursing practice, clinical research, and professional development. The journal's goal is to enhance the knowledge and skills of medical-surgical nurses to promote health, prevent and manage disease, alleviate suffering, and improve health outcomes across medical-surgical populations.

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Scoping Review

Psychomotor Skills for Nurses Transitioning to Practice: A Scoping Review

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Dohm, M., & Prochnow, J.A. (2025). Psychomotor skills for nurses transitioning to practice: A scoping review. *MEDSURG Nursing, 34*(1), 7-14. https://doi.org/10.62116/MSJ.2025.34.1.7

Acquisition of psychomotor skills is important for new graduate nurses. Eight papers met inclusion criteria for this review. Further research is needed to understand this component of transitioning to practice and its impact on new graduate nurses' confidence in skills application.

Keywords: new graduate nurse, skills training, transition to practice, orientation, nurse residency programs, psychomotor skills

Learning Outcome: After completing this education activity, the learner will be able to describe the impact of psychomotor skills education on the transition to practice of new graduate nurses in the acute care medical-surgical setting.

Transition to practice (TTP) programs and graduate nurse residency programs (NRPs) were developed in response to the Institute of Medicine's *Future of Nursing: Leading Change, Advancing Health* report (2011) in the United States. That report suggested NRPs were successful in reducing new graduate nurse (NGN) turnover in the first year of practice by increasing autonomy and clinical decision-making skills. The updated *Future of Nursing 2020-2030: Charting a Path to Achieve Health Equity* (National Academies of Sciences, Engineering, and Medicine, 2021) did not include follow-up recommendations on NRPs. This more recent report stressed the importance of educating nurses to promote equity through interprofessional collaboration and creating an inclusive environment, but no specific strategies were offered to overcome the education-practice barrier. In the years since the first NRPs were designed, different components of these programs have been reviewed (Goode et al., 2013). While themes exist, no one model or design has been identified.

TTP programs or NRPs have been deemed an important component of the successful retention of NGNs transitioning to practice (Asber, 2019; Charette et al., 2023). Transitioning to practice in medical-surgical units during and after the COVID pandemic has impacted the nursing workforce. Many NGNs have left the impatient environment or expressed an intent to leave (Failla et al., 2021). As workloads and staffing challenges continue following the pandemic, strategies that provide the most impact in assisting NGNs in their transition should be investigated. One component of interest is the acquisition and retention of psychomotor skills.

Statement of the Clinical Problem

Even before the COVID pandemic, retention of NGNs was an identified issue (Asber, 2019). Turnover of seasoned and new nurses during and after the pandemic increased due to elevated workloads, high patient ratios, and insufficient resources (Bae, 2023; Chargualaf et al., 2023). Additionally, NGNs entering professional practice during the pandemic experienced decreased face-to-face clinical experiences and less opportunity to practice psychomotor, time management, and soft skills with live patients (McMillan et al., 2023). Seasoned preceptors for capstone and post-graduation orientation decreased in number due to turnover, with remaining preceptors experiencing burnout from the

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continuous orientation of nursing students and NGNs (Chargualaf et al., 2023). While many NGNs recognize the need for additional opportunity to practice soft skills, some authors suggest TTP needs also include the opportunity to practice advanced technical skills such as complex medication management and use of medical devices (Song & McCreary, 2020) Changes in the post-pandemic landscape decrease the opportunity for NGNs to consolidate their knowledge and skills (McMillan et al., 2023).

Objectives of the Review

This scoping review aimed to determine potential benefits of including psychomotor skills education in NRPs in medical-surgical units. Of particular interest was the impact of this education on NGN confidence, skills retention, TTP, and retention.

Relevant Literature

In a systematic review, Ackerson and Stiles (2018) investigated the value of NRPs for NGNs. They discussed themes of internally versus externally developed programs, retention and turnover, return on investment, and measurement tools to evaluate NRP effectiveness. Authors found NRPs are successful in retaining NGNs in acute care settings, regardless of their model. Return on investment calculations demonstrated a positive return within the first year of employment, but retention did not continue through the second year of NGN employment. Multiple evaluation tools were identified, but no consensus of tool was reached.

Although there is cost associated with the TTP and NRPs, the cost of NGN turnover is higher. One study estimated the cost to replace an NGN is 0.31 to 1.3 times the salary of the nurse (Bae, 2022). In 2023, approximately a quarter of all newly hired registered nurses (RNs) left within the first year (Nursing Solutions Inc. [NSI], 2024). This turnover rate not only affects clinical nurses but also impacts the healthcare system financially. Turnover rates in the United States increased to approximately 28% during the pandemic (Bae, 2023). The average cost of turnover in 2023 increased 7.5% to $56,300 for a clinical RN (NSI, 2024). With these costs expected to continue to increase, interventions to improve NGN retention will be an important mediator in overall hospital expenditure.

Components of orientation, TTP programs, and NRPs vary within the literature. Despite variation within components, Rush and coauthors (2019) reported TTP programs generally included "education, formal or informal preceptorships, mentorships, supernumerary times, and unit specific orientation" (p. 140). Educational components were defined to include a variety of modalities, such as workshops, classes, journaling, simulation, case studies, and online modules; however, few of these were evaluated individually for efficacy. Miller and colleagues (2023) also described teaching methodologies used in a TTP program, which included journaling, return demonstration of skills, chart audits, simulation, and case studies. These strategies were not evaluated individually, however.

In traditional models of nursing education, psychomotor skills are taught and validated by nursing faculty early in an academic program of study (Kardong-Edgren et al., 2019) using task trainers in a controlled environment. They may not be revisited, keeping learners from achieving the associative level of skills development refelected in the Psychomotor Skills Learning Theory (Schmidt & Lee, 2005). Additional technical skills training with site-specific equipment allows NGNs to refine their skills to ensure safe practice and skill mastery.

The orientation phase for NGNs is critical in their transition to practice. While there are many components described in the literature, psychomotor skills training is addressed rarely. With the cost of nurse turnover continuing to increase and a quarter of new nurses leaving within the first year, TTP programs and NRPs need to define necessary components to impact these numbers. Training to ensure psychomotor skills competency as a part of these programs needs further focus in the literature.

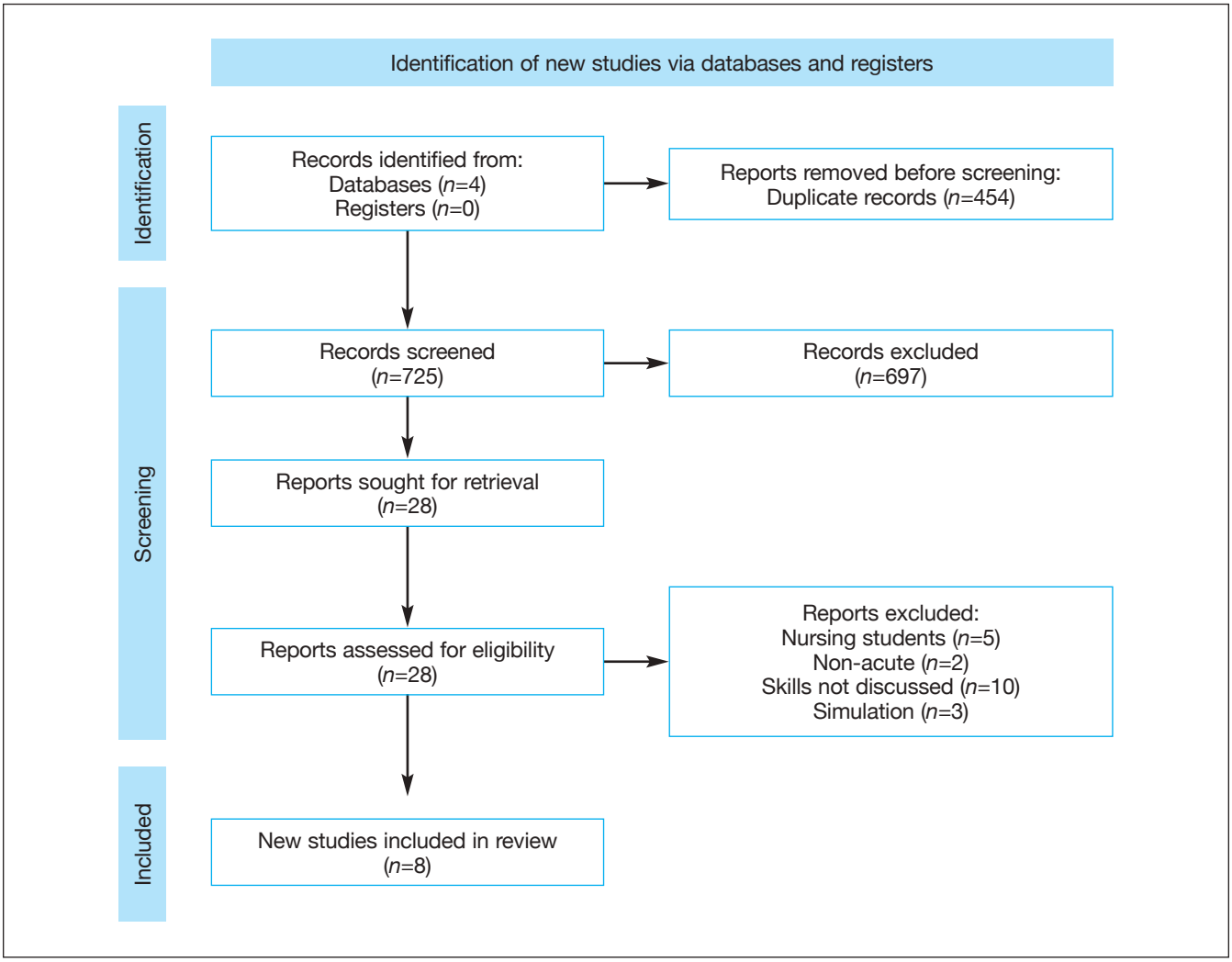
Methods for Conducting the Review

This scoping review was completed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation (Tricco et al., 2018). An *a priori* scoping review protocol was developed to align with the aim of this review. Articles were eligible for inclusion if they represented original research or a review and addressed NGNs within the first year of practice in an acute care setting. Articles had to be written in English and published January 2018-October 2023 to reflect the most recent literature on TTP best practices. Articles using simulation as a primary teaching and evaluating method for technical or psychomotor skills were excluded as some sites do not have simulation centers or access to simulation-based training.

Sources and Selection

Literature searches were conducted by the first author using a search engine MavScholar that combined articles from CINAHL, OVID, Nursing and Allied Health Database, and ProQuest. Guidance was provided from a librarian at Minnesota State University, Mankato. Additional searches were conducted with Google Scholar. Search terms included *new graduate nurs*, graduate nurs*, orientation, nurs* residency program, transition to practice*, and *psychomotor skill**. The search returned 1,180 articles, with 725 remaining after duplicates were removed. Following a screening of titles and abstracts, 28 articles were reviewed; eight articles were retained for an in-depth examination (see Figure 1 for representation of the search and evaluation).

Figure 1.
PRISMA Search Flow Diagram



Source: Haddaway et al., 2022

Hand-searching reference lists of identified articles did not return any further resources. Following article retrieval, all citations were imported into Zotero Version 6.0 (Corporation for Digital Scholarship, Vienna, VA) to allow review.

Results

Evidence in the eight identified articles was reviewed using levels of evidence (Fineout-Overholt, 2023). Most articles were integrative reviews (Asber, 2019; Rush et al., 2019; Song & McCreary, 2020; Tyndall et al., 2018), small-scale qualitative studies, or case reports (Charette et al., 2023; Letourneau & McCurry, 2019). However, two studies compared interventions with a control group (Lengetti et al., 2018; Miller et al., 2023). Six specifically addressed effectiveness and design of TTP programs or NRPs (see Table 1). Two articles examined psychomotor skills training as a part of new graduate orientation to acute care settings (see Table 2).

Transition to Practice/ Nurse Residency Programs

Many studies investigated retention outcomes for NRPs, and results suggested NRPs may impact retention rates positively at 1 year (Asber, 2019; Miller et al., 2023; Song & McCreary, 2020). Programs ranged from 12 weeks to 1 year and included a variety of structural differences, such as preceptor training, mentorship, development days, case studies, workshops, in-services, and simulations (Asber, 2019; Rush et

TABLE 1.
Effectiveness and Designs Articles

Source	Purpose	Population/ Sample Size/Setting	Design/ Framework	Instruments	Findings	Nursing Implications	Level of Evidence*
Asber (2019)	Determine effect of NRPs on NGN retention.	16 studies, including descriptive, prospective cohort, longitudinal mixed methods, cross-sectional descriptive, regression modeling	Whittemore and Knafl integrative review methodology		TTP programss had positive effect on retention rates in 13/16 reviewed studies. Organization-based programs demonstrated the lowest retention rates; the longer the program, the better the retention rates.	Not all NRPs are the same in design, and program structure matters.	Level V
Charette et al. (2023)	Assess NGN overall competence at 3, 6, 9, 12 months; explore NGN job satisfaction at 12 months.	Two hospital systems in Australia Participation: Initial assessment (*n*=88) 3 months (*n*=29) 6 months (*n*=15) 9 months (*n*=11) 12 months (*n*=9)	Concurrent mixed methods study: observational prospective quantitative phase and descriptive qualitative phase	Nurse Competence Scale (NCS), Nursing Satisfaction Scale	NCS administered at 3, 6, 9, 12 months. No significant increase in competencies occurred at 6 or 9 months, but four of seven NCS categories showed significant increase at 12 months.	TTP programs provide some support, but may not be enough. Further information needed to understand how NGNs develop confidence over first year.	Level VI
Letourneau & McCurry (2019)	Evaluate effectiveness of TTP program on development of quality and safety competence in NGNs.	64 NGNs from TTP programs at three hospital systems	Quasi-experimental pre/posttest design	Nursing Quality and Safety Self-Inventory	NGNs at hospitals 2 and 3 had increased knowledge and skills scores; those at hospital 1 had decreased scores.	NGNs have increased confidence in KSAs after completing TTPs. Formal TTPs should last at least 6 months.	Level VI
Miller et al. (2023)	Examine if nurses in an NRP transition more successfully than those in a traditional orientation program.	106 newly employed registered nurses	Prospective, longitudinal, quasi-experimental	Casey-Fink Readiness for Practice, Nurse Job Satisfaction, Nurse Turnover and Retention Surveys	Reported three most uncomfortable skills at baseline, 6 weeks, 3 months, 12 months. NRP made significant differences in readiness for practice, perceptions about retention, and job satisfaction.	Future research should determine which NRPs offer best content, programming, experiential learning.	Level IV

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TABLE 1. (CONTINUED)
Effectiveness and Designs Articles

Source	Purpose	Population/ Sample Size/Setting	Design/ Framework	Instruments	Findings	Nursing Implications	Level of Evidence*
Rush et al. (2019)	Identify best practices of formal NGN TTP programs.	76 studies, including qualitative, descriptive, ethnographic, mixed methods, hermeneutic, longitudinal, constructivist grounded theory, quasi-experimental, RCT, cross-sectional	Integrative review Cooper's five-stage approach supplemented by PRISMA guidelines		A range of activities used in TTP programs, but few were evaluated as independent activities. Bundled strategies enhanced preceptor support and had positive influence on NGN TTP.	More rigorous studies are needed on specific elements of TTP programs.	Level V
Tyndall et al. (2018)	Analyze published research on relationship between NRP/TTP programs and patient safety outcomes.	20 studies, including cohort, repeated measures, longitudinal, multiple cohort repeated measures, descriptive, RCT multi-site	Integrative review Systems Engineering Initiative for Patient Safety (SEIPS) framework Whittemore and Knafl five-stage method		Most studies reported outcomes from employer-developed transition programs; preceptor/NGN relationship correlated with higher scores in NGN competency. Ongoing professional development classes discussed.	Findings highlighted variations in program characteristics, research design, measurement strategies; lack of controlled group studies does not allow generalizable conclusions.	Level V

NGN=new graduate nurse, NRP=nurse residency program, TTP=transition to practice

*Fineout-Overholt (2023)

al., 2019). Specific NRPs from Versant (n.d.) and the American Association of Colleges of Nursing (AACN, n.d.) were identified, each with distinctive components and approaches. The Versant program included competency evaluation and remediation, but the AACN program lacked explicit details on skill development components. Program length is not the only determinant of success; organization commitment and program structure also play critical roles (Asber, 2019; Miller et al., 2023).

Evaluation of the effectiveness of NRPs and TPP programs often relies on self-reported data from NGNs, such as surveys assessing perceived confidence, competence, and job satisfaction (Letourneau & McCurry, 2019; Miller et al., 2023; Tyndall et al., 2018). More objective assessments are needed to determine participant competence and skill development. While factors, such as simulations, didactic content, and hands-on clinical time with preceptors, have been associated with improved competency scores (Charette et al., 2023; Letourneau & McCurry, 2019), the individual impact of these components has not been investigated.

Psychomotor Skills for NGNs

Literature on psychomotor skills acquisition and competency for NGNs is limited. A few articles addressed use of simulation-based education for psychomotor skills acquisition and competence evaluation (Rutherford-Hemming et al., 2022; Sterner et al., 2022, 2023) Two articles discussed psychomotor skills acquisition and competence assessment evaluated as a standalone educational component (Lengetti et al., 2018; Song & McCreary, 2020).

In an integrative review of NGNs' self-assessed competencies, Song and McCreary (2020) found NGNs feel comfortable with basic technical skills but need more training with advanced technical skills. Authors defined basic technical skills as medication administration and simple dressing changes. Advanced technical skills included air-

TABLE 2.
Psychomotor Skills Articles

Source	Purpose	Population/ Sample Size/Setting	Design/ Framework	Instruments	Findings	Nursing Implications	Level of Evidence*
Lengetti et al. (2018)	Examine effects of mastery learning on NGN skill for indwelling urinary catheter insertion.	40 NGN BSN graduates enrolled in NRP, 20 assigned to each group	Longitudinal RCT comparing traditional learning/ evaluation to mastery learning design	Survey of Academic Self-Regulation (SASR), Performance Assessment Tool (PAT)	Retention of critical steps was improved significantly in experimental group over control group.	Education that fosters retention of critical elements may contribute to less patient harm; promotion of self-regulation practices results in confidence and motivation to ask for help.	Level III
Song & McCreary (2020)	Identify competencies required to prepare novice nurses, with a goal of increasing retention, improving quality outcomes.	16 studies, including longitudinal, cross-sectional, qualitative, and quantitative research	Integrative review Whittemore and Knafl Methodology Framework		NGNs have basic competencies but need further development due to increasing demands. NGNs need further development in soft skills.	NGNs should be given more opportunity to practice advanced technical and soft skills repeatedly in a safe environment.	Level V

NGN=new graduate nurse, NRP=nurse residency program, RCT=randomized controlled trial

*Fineout-Overholt (2023)

way and intravenous line management, complex dressing changes, and tube feedings.

One study addressed urinary catheterization competence with NGNs in an NRP (Lengetti et al., 2018). Catheter-associated urinary tract infections are costly to hospital systems. Evaluating catheter insertion skill competence for all NGNs was identified as a way to decrease cost and improve patient care and clinical performance. In this randomized controlled trial, a standardized tool evaluated two groups of NGNs on their catheter insertion competence. The experimental group was allowed multiple attempts and feedback during the procedure, while the control group performed the skill once and was provided feedback at completion. Both groups were evaluated 1 month later. While there was no significant difference between or within groups, the experimental group retained 17 critical steps identified during the initial training and the control group did not.

Discussion and Implications for Practice, Education, and Research

TTP programs and NRPs are recognized as crucial for supporting the successful transition of NGNs into the workforce, with a specific focus on enhancing retention rates (Asber, 2019; Failla et al., 2021; Miller et al., 2023). However, the substantial impact of the COVID pandemic on the nursing workforce, particularly in medical-surgical units (NSI, 2024), has underscored the need for effective strategies to support NGNs as they transition into professional practice. While TTP programs and NRPs demonstrate cost savings when compared to the cost of NGN turnover (Bae, 2022; Silvestre et al., 2017), identifying the most effective components for supporting role transition and retention is necessary.

Findings of this scoping review confirm additional research is needed to identify value-added components of NRPs and TTP programs

and determine which activities should be removed or revised due to ineffectiveness. The variation in program design may make this evaluation challenging, however (Rush et al., 2019). Identification of best practices may improve NGNs' readiness for practice as well as their confidence in psychomotor skills.

Song and McCreary (2020) suggested TPP programs and NRPs should include structured psychomotor skills training to address NGNs' perceived need for further development. Deliberate practice strategies could be integrated into these programs to assist in faster skill acquisition and contribute to greater retention among NGNs (Yoshida et al., 2022). Healthcare leaders should consider the duration of TTP programs and NRPs as longer programs have been associated with improved competence and retention rates (Charette et al., 2023). Programs should maintain consistency in design across learners and incorporate multiple teaching-learning strategies in addition to time on the unit (Letourneau & McCurry, 2019). Objective assessments should be used as well to evaluate psychomotor skill competency rather than relying solely on self-reported data (Tyndall et al., 2018).

Most authors recognized the need for studies to investigate NRP components to determine individual effectiveness and impact on NGN transition (Charette et al., 2023; Miller et al., 2023; Rush et al., 2019). Studies evaluating NRP didactic only versus didactic with skills or simulation also are missing in the literature. Many studies and integrative reviews investigated single sites or multiple sites within the same hospital system (Charette et al., 2023; Lengetti et al., 2018; Miller et al., 2023). Only one multiple-hospital system study was located (Letourneau & McCurry, 2019). Large-scale multi-site studies comparing NRPs or TTP programs are needed.

This scoping review presents an in-depth analysis of relevant literature on TTP programs and NRPs, describing program components, methods of evaluation, and their impact on NGNs. It identifies knowledge gaps in the literature regarding effectiveness of individual program components, especially psychomotor skills education and acquisition in NGNs. Adhering to PRISMA-ScR guidelines contributed to a thorough review of relevant literature on TTP programs and NRPs. Additionally, this review highlights the need for consistency in program design and evaluation for objective measurement of competency in NGNs.

Scoping reviews may have inherent limitations because of the wide area of literature surveyed regarding this topic (Munn et al., 2018). Because this review primarily addressed psychomotor skills acquisition in acute care facilities, the depth of analysis may be limited due to a narrow focus. Additionally, reliance on self-reported data from NGNs in many of the included articles raises concerns about potential bias and limitations in addressing competence and skill development. Literature before 2017 was not included in this search; however, this exclusion criterion may have resulted in missed articles citing psychomotor skill development that may guide practice in this area. Experiences by persons in other roles, such as medical provider and emergency medical technician, also may have provided insight into technical skills acquisition and offered additional guidance on this topic.

Conclusion

This scoping review was designed to examine components of TTP programs and NRPs for new graduate RNs in acute care medical-surgical settings. While a great deal is known about the value of these programs, this review found TTP programs and NRPs may be inconsistent in their components, making them difficult to study and compare (Asber, 2019; Miller et al., 2023; Rush et al., 2019). Optimizing these programs requires a deeper understanding of their components and contributions to a smooth role transition for NGNs. Further study is needed to determine if the inclusion of psychomotor skills training and evaluation aids in TTP. Additionally, future research should be conducted to determine the value of other specific components of these programs, including didactic, mentorship, simulation, and other hands-on experiences. MSN

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Nursing Pharmacology

Carbidopa/Levodopa Formulations for Treatment of Parkinson's Disease

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Carbidopa-levodopa is the primary treatment for motor symptoms associated with Parkinson's disease. Medical-surgical nurses need a comprehensive understanding of the various carbidopa/levodopa formulations to provide effective care. Mechanism of action, pharmacokinetics, and available formulations of carbidopa/levodopa are examined.

Keywords: Parkinson's disease, neurodegeneration, motor system, dopamine, carbidopa, levodopa

Learning Outcome: After completing this education activity, the learner will be able to discuss the appropriate use of available carbidopa/levodopa formulations in the treatment of patients with Parkinson's disease.

Parkinson's disease (PD), the second most common neurodegenerative disorder, affects about 1 million people in the United States and 10 million globally (Parkinson's Foundation, n.d.). The incidence of PD in this country is 50% higher than previously estimated, with 90,000 new cases annually compared to earlier estimates of 60,000 (Willis et al., 2022). PD is characterized by degeneration of dopamine-producing neurons in the substantia nigra, leading to impairment of the extrapyramidal motor system (Smith, 2022). This dopamine loss results in hallmark motor symptoms, such as resting tremor, rigidity, bradykinesia, and postural instability, along with non-motor symptoms (e.g., cognitive decline, mood disturbances, autonomic dysfunction) that can precede motor issues (Smith, 2022; Zafar & Yaddanapudi, 2023). Because no cure exists, treatment focuses on symptom management to enhance quality of life and maintain functional independence (Smith, 2022).

Carbidopa-levodopa remains the mainstay treatment for PD motor symptoms, particularly in older patients, by boosting dopamine levels in the brain to result in significant motor improvement (Koch et al., 2023; Smith, 2022). However, long-term use can lead to motor complications. A 2023 study of over 210,000 Medicare beneficiaries with PD found 51.1% began treatment with carbidopa-levodopa monotherapy, while only 5.9% started with dopamine agonists alone (Song et al., 2023). Medical-surgical nurses need a thorough understanding of the various carbidopa/levodopa formulations to provide effective care. Mechanism of action, pharmacokinetics, and available formulations of carbidopa/levodopa are examined here.

Mechanism of Action and Pharmacokinetics of Carbidopa/Levodopa

Unlike dopamine, levodopa can cross the blood-brain barrier and transform into dopamine within the central nervous system (CNS), thereby restoring reduced levels observed in PD. However, L-amino acid decarboxylase metabolizes levodopa in the periphery, reducing its bioavailability in the CNS and causing side effects, such as diarrhea, nausea, and vomiting due to excess dopamine in the gastrointestinal tract (Gandhi & Saadabadi, 2023; Leyden & Tadi, 2023). To prevent peripheral metabolism, carbidopa, a decarboxylase enzyme inhibitor that cannot cross the blood-brain barrier, is co-administered (Koch et al., 2023). This increases levodopa's

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availability in the CNS, allowing up to 75% lower dosage while effectively managing parkinsonian motor symptoms (Leyden & Tadi, 2023).

Levodopa typically reaches peak plasma levels in 30-120 minutes, but its concentration is influenced by gastric emptying factors, such as excess stomach acid, food, and anticholinergic medications (Koch et al., 2023; Smith, 2022). Levodopa is absorbed in the proximal duodenum via a saturable large neutral amino acid transporter. However, its bioavailability can be reduced by competition from dietary amino acids such as leucine and phenylalanine, though this effect is more pronounced in advanced PD. For patients with advanced PD, protein-restricted diets may improve levodopa responsiveness. Carbidopa inhibits peripheral decarboxylation, shifts levodopa metabolism to 3-O-methylation by catechol-O-methyltransferase (COMT), and extends its elimination half-life from 1 hour to 1.5 hours (Koch et al., 2023).

Formulations of Carbidopa/Levodopa

Carbidopa/Levodopa Immediate-Release (Sinemet®)

Immediate-release (IR) tablets are typically the first-line pharmacotherapy for PD (American Parkinson Disease Association [APDA], 2024). They are available in three strengths: 10/100 mg, 25/100 mg, and 25/250 mg, with the lower number indicating the amount of carbidopa and the higher number representing levodopa. The IR formulation peaks in plasma in 30-60 minutes and has a half-life of 1.5-2 hours (Patel, 2024). The initial dosage is usually 25/100 mg three times daily or 10/100 mg three to four times daily, which can be increased gradually by one tablet daily or every other day as needed, up to a maximum of eight tablets per day. Dosage adjustments can involve different tablet ratios (1:4 or 1:10) to achieve optimal treatment (Drugs.com, 2023a).

In early PD, a single dose may provide symptom relief for 6 hours or more (APDA, 2024). However, as the disease advances, the duration of symptom control (ON time) shortens, leading to more frequent OFF periods in which the medication's effects diminish. After 5 years of treatment, about 50% of patients with PD experience motor fluctuations, an alternation between ON and OFF periods (APDA, 2024; Patel, 2024). Increased frequency of OFF periods may necessitate higher or more frequent doses, or providers may switch to a longer-acting or on-demand carbidopa/levodopa formulation (Patel, 2024).

To maintain consistent symptom control, doses should be spaced evenly throughout the day (Patel, 2024). Patients experiencing gastrointestinal discomfort can take carbidopa/levodopa with their meals, with optimal absorption occurring 1 hour before or 2 hours after protein-rich meals. High-protein diets can interfere with absorption due to competition with amino acid transporters, while high-fat, high-calorie meals should be avoided as they can delay absorption by up to 2 hours due to slower gastric emptying (Gandhi & Saadabadi, 2023; Patel, 2024). These dietary guidelines apply to all oral formulations of carbidopa/levodopa.

Carbidopa/Levodopa Orally Disintegrating Tablets (Parcopa®)

Parcopa, also an IR formulation of carbidopa/levodopa, is suitable for patients with difficulty swallowing (Patel, 2024). The tablet dissolves on the tongue without the need for water and should be handled with dry hands to prevent premature dissolution. Tablets should not be swallowed whole, chewed, broken, or crushed (Drugs.com, 2024a). The drug reaches peak plasma levels within 30 minutes (Patel, 2024). Although it dissolves in the mouth, absorption occurs in the small intestine (Gandhi & Saadabadi, 2023; Patel, 2024). In addition to standard dietary recommendations for carbidopa/levodopa, this formulation should not be taken with iron tablets or multivitamins containing iron as this can interfere with absorption (Drugs.com, 2024a).

Carbidopa/Levodopa Controlled-Release (CR) Tablets (Sinemet CR®)

Sinemet CR is a sustained-release formulation with 70%-75% of the bioavailability of the IR version. Despite the discontinuation of the brand name, generic versions remain accessible in 25/100 mg and 50/200 mg strengths (APDA, 2024). The development of the CR formulation aimed to extend the effects of each dose of levodopa; however, some patients may experience a similar duration of effects as the IR formulation. Higher daily doses may be required to achieve similar symptom control as IR formulations due to its lower systemic bioavailability (Patel, 2024). Its peak onset is 1.5-2 hours. The polymer-based delivery system releases the medication over a period of 4-6 hours, enabling three daily doses. Additionally, providers may prescribe it at bedtime to manage nighttime symptoms and minimize morning OFF periods (APDA, 2024). Patients also may take an IR dose with their first morning CR dose to counteract the delayed onset. This formulation should be swallowed whole to prevent rapid release and absorption (Drugs.com, 2023c; Patel, 2024).

Carbidopa/Levodopa Extended-Release (ER) Capsules (Rytary®, Crexont®)

Two ER carbidopa/levodopa capsules are currently available, offering approximately 70% bioavailability relative to IR formulations and a peak onset of about 1 hour. Their time-release bead design provides prolonged levodopa effects; each capsule contains a mix of one-third IR beads for immediate onset and two-thirds ER beads for sustained release, maintaining therapeutic levels for up to 5 hours. Additionally, the inclusion of tartaric acid enhances absorption by creating an acidic environment (Patel, 2024). Due to differences in dosing

and pharmacokinetics, ER capsules are not interchangeable with other carbidopa/levodopa formulations. Manufacturer prescribing guidelines should be consulted for IR-to-ER conversion (Drugs.com, 2024c; Patel, 2024).

Rytary is available in strengths of 23.75/95 mg, 36.25/145 mg, 48.75/195 mg, and 61.25/245 mg. The starting dose for levodopa-naive patients is 23.75/95 mg taken orally three times daily for the first 3 days, with an increase to 36.25/145 mg three times daily on the fourth day (Drugs.com, 2023b).

Crexont, a recently approved ER formulation, extends levodopa release further than Rytary® by incorporating enteric-coated granules that prevent premature breakdown in the stomach. A mucoadhesive polymer allows granules to adhere longer to the absorption site in the small intestine, while a sustained-release polymer coating slows levodopa release upon reaching the intestines (APDA, 2024). Crexont is available in 35/140 mg, 52.5/210 mg, 70/280 mg, and 87.5/350 mg. For levodopa-naive patients, the initial dose is 35/140 mg twice daily for the first 3 days, with gradual increases as needed to a maximum of 525/2100 mg per day in up to four divided doses (Drugs.com, 2024c). For patients with difficulty swallowing, capsules for both medications can be opened and the beads sprinkled onto food without compromising their ER properties (APDA, 2024).

Carbidopa/Levodopa/Entacapone (Stalevo®)

Entacapone, a selective COMT inhibitor, enhances the effects of levodopa in this formulation by supporting carbidopa in reducing peripheral levodopa breakdown (APDA, 2024; Muranova & Shanina, 2023). Entacapone has minimal impact on other catecholamines, such as epinephrine and norepinephrine. Stalevo® extends levodopa's half-life by up to 75%, increasing plasma concentration and prolonging dopamine availability in the CNS. This combination is indicated for PD patients who already are taking levodopa, carbidopa, and entacapone separately, or require a substitute for carbidopa/levodopa due to OFF periods on daily levodopa doses of 600 mg or less, provided they do not experience dyskinesia (Muranova & Shanina, 2023). Stalevo is available in various strengths: 12.5/50/200 mg, 18.75/75/200 mg, 25/100/200 mg, 31.25/125/200 mg, 37.5/150/200 mg, and 50/200/200 mg, with numbers indicating doses of carbidopa, levodopa, and entacapone, respectively (APDA, 2024).

Carbidopa/Levodopa Enteral Suspension (CLES; Duopa®)

Duopa, a carbidopa/levodopa gel, is infused directly into the small intestine through a nasojejunal or percutaneous endoscopic gastrostomy-jejunostomy (PEG-J) tube over 16 hours to improve absorption and reduce issues such as low plasma trough levels and motor complications seen with oral administration (Gandhi & Saadabadi, 2023). After 12 weeks, Pahwa and co-authors (2022) reported CLES-treated patients had significantly more days with ON periods free of troublesome dyskinesia within 30 minutes of waking compared to baseline (33% vs. 11%, p=0.0043), with no comparable improvement in the IR group. Additionally, fewer patients in the CLES group experienced extreme fluctuations at week 12 (3% vs. 23%, p=0.0224) and showed a more significant reduction in the average number of motor-state transitions than those on IR formulations (-1.6, p=0.0295).

To administer Duopa, a PEG-J tube is inserted through a minor procedure (APDA, 2024). The external tubing connects to a portable pump, which delivers the gel from a cassette. Patients collaborate with their neurologist to adjust pump settings for optimal symptom control. Before PEG-J placement, the gel can be administered temporarily via a nasojejunal tube. For a smooth transition to enteral therapy, all carbidopa/levodopa formulations should be converted initially to the IR version (Patel, 2024). If enteral carbidopa/levodopa is unavailable in a hospital setting, consulting a neurologist to arrange a temporary switch to IR is recommended; outpatient follow-up care should ensure continuity upon discharge. Nurses should monitor for signs of gastrointestinal complications during therapy, which include abdominal pain, prolonged constipation, nausea, vomiting, fever, and melanotic stool (Vallerand & Sanoski, 2022).

Levodopa Inhalation Powder (Inbrija®)

Designed as an on-demand supplement to regular carbidopa/levodopa therapy to manage OFF periods in advanced PD, Inbrija is an inhalation powder containing only levodopa. It provides symptom relief within approximately 10 minutes. Each dose consists of two 42 mg capsules, which are inhaled individually using the Inbrija-specific inhaler (APDA, 2024; Patel, 2024). Levodopa is absorbed through the lungs, bypassing the gastrointestinal system for a quicker onset. During an OFF episode, the patient removes a capsule from its blister pack, inserts it into the device, inhales, and then repeats the process with the second capsule. Patients can repeat this process up to five times per day as needed (APDA, 2024). Because some patients with severe symptoms may struggle with setting up the inhaler, caregivers also should receive training on its proper use (Patel, 2024).

Additional Nursing Considerations

Patients with a history of angle-closure glaucoma, malignant melanoma, or undiagnosed skin lesions, or those taking monoamine oxidase inhibitors (MAOIs) should not take carbidopa/levodopa. It is important to discontinue MAOIs at least 2 weeks before starting carbidopa/levodopa therapy, as co-administration can lead to hypertensive reactions (Vallerand & Sanoski, 2022). Common side effects of carbidopa/levodopa therapy include nausea and vomiting, especially early in treatment;, constipation;

dizziness/lightheadedness often related to orthostatic hypotension; daytime sleepiness or insomnia; dry mouth; headache; dyskinesia with prolonged use; hallucinations and confusion, particularly in older adults and advanced PD cases; depression or anxiety; and darkened bodily fluids (e.g., urine, saliva, sweat) (Drugs.com, 2024b).

Nurses should advise patients to avoid driving and other activities that require alertness until they are familiar with their response to the medication. Patients also should be encouraged to change positions slowly to reduce dizziness or lightheadedness from orthostatic hypotension. For dry mouth, nurses can recommend good oral hygiene and suggest sugarless candy or gum to stimulate saliva. Serious side effects include hepatotoxicity and melanoma. Nurses should instruct patients and their families to monitor skin lesions for any changes and report these immediately, as carbidopa/levodopa may activate malignant melanoma (Vallerand & Sanoski, 2022).

Conclusion

Medical-surgical nurses need a comprehensive understanding of the various carbidopa/levodopa formulations to support patients with PD, as well as their caregivers and families. As the primary treatment for managing PD motor symptoms, carbidopa/levodopa requires careful administration and monitoring. Knowledgeable nurses can provide essential guidance on correct administration and side effect management, ultimately improving patient outcomes and quality of life. MSN

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Reducing Use of PRN Intravenous Antihypertensive Medications: Implementation of a Clinical Assessment Tool

Richard M. Clapp

In adult patients with chronic asymptomatic hypertension in the outpatient setting, evidence has established a clear benefit for lowering blood pressure (BP) to reduce future cardiovascular risk. Consensus guidelines exist to address management of this common outpatient condition, including the 2023 European Society of Hypertension Guidelines (Mancia et al., 2023), the 2020 International Society of Hypertension Global Hypertension Practice Guidelines (Unger et al., 2020), and the 2017 American College of Cardiology/American Heart Association Guidelines (Welton et al., 2018). In contrast, no evidence or consensus guidelines exist to guide management of acute asymptomatic hypertension in adult inpatients. Common practice is to reduce elevated BP rapidly by administering as needed (PRN) intravenous (IV) antihypertensive medications. However, literature has demonstrated these medications, such as hydralazine and labetalol, may produce unpredictable results and even result in patient harm. Other factors (e.g., pain; anxiety; drug, alcohol, and medication withdrawal; urinary retention; volume excess) also have been identified as causing or exacerbating BP elevations

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Despite documented harms and lack of benefit, PRN intravenous antihypertensives are administered routinely to lower asymptomatic elevated blood pressure. Implementation of a clinical assessment tool may increase nurse confidence and reduce the number of antihypertensive doses administered.

Keywords: clinical judgment, nursing assessment, asymptomatic elevated blood pressure, antihypertensives

Literature Summary

- Elevated blood pressure (BP) in hospitalized adults is common. In a landmark systematic review, Axon and co-authors (2011) first reported the prevalence of elevated BP to be 50%-72%. Rastogi and co-authors (2021) found 78% of adults admitted for non-cardiovascular diagnoses had at least one elevated BP reading during hospitalization.
- Progression to severe hypertension is not as common. Ghazi and co-authors (2021) found only 10% of adults admitted for reasons other than hypertension developed severe hypertension.
- Use of as needed antihypertensive medications is associated with greater risk of abrupt drop in BP, acute kidney injury, stroke, in-hospital mortality, and prolonged length of stay (Mohandas et al., 2021). Patients who receive intravenous (IV) antihypertensives are more likely to develop myocardial injury during hospitalization than those who do not receive treatment (Ghazi et al., 2023).
- Projects to reduce use of PRN antihypertensives have been effective. The "No IV for High BP" educational campaign (Jacobs et al., 2019) led to a 38% reduction in odds of being treated for asymptomatic elevated BP. The interprofessional intervention "Assess before Rx" (Pasik et al., 2019) resulted in a decrease in inappropriate orders for PRN IV antihypertensives from 8.3 to 3.3 per 1,000 patient days.

Quality Indicator & Data Collection Methods

- A clinical assessment tool was developed by an interprofessional team to address inappropriate medication use.
- Before project implementation, nurses completed education through two asynchronous online learning modules.

Clinical Setting/Patient Population/Average Daily Census

- 42-bed, adult medical-surgical unit in a 145-bed community hospital in east central Illinois; average daily census during project period was 42 (100% capacity).
- 46 nurses employed on the unit

Program Objectives

- Assess the impact of the clinical assessment tool on the project site unit in reducing the administered doses of PRN IV antihypertensives.
- Increase nurse confidence in assessing patients with elevated BP and communicating findings to the provider.

in the setting of acute illness (Jacobs et al., 2019). While these mitigating factors may elevate a patient's BP, none of them would be treated with PRN IV antihypertensive medications. Despite lack of benefit, documented harms, and the common occurrence of confounding secondary causes, PRN IV antihypertensive medications are used routinely in the inpatient setting for the treatment of asymptomatic elevated BP.

Project Site and Reason for Change

The project site was a 42-bed, adult medical-surgical unit in a 145-bed community hospital in east central Illinois. Anecdotal observations at the project site by hospitalists identified increasing calls from clinical nurses reporting elevated patient BP, with a subsequent increase in orders for PRN IV antihypertensives. In most cases, hospitalists indicated elevated BP was identified during routine vital signs assessment. Clinical nurses were following a standard admission order requiring provider notification of a BP reading outside acceptable parameters; the provider was following traditional protocol at the project site in ordering a PRN IV antihypertensive medication. Current protocol did not prompt assessment of the patient or encourage identification of secondary, potentially treatable causes that may be contributing to the elevated BP.

The most common PRN IV antihypertensives administered at the project site identified by pharmacy staff were hydralazine (Apresoline®) and labetalol (Trandate®). Preimplementation data collection by pharmacy staff found 393 doses of IV hydralazine and labetalol were administered on the project unit in the 6 months preceding project implementation.

The aims of this project were to assess the impact of implementing a clinical assessment tool to guide nurse assessment and nurse-to-provider communication regarding adult patients with asymptomatic elevated BP and to reduce unnecessary use of PRN IV antihypertensives.

Program

A clinical assessment tool was developed by an interprofessional team that included representatives from medicine, nursing, and pharmacy. Additional feedback was sought from hospitalist providers and unit nurse managers. The *Nurse Inpatient Hypertension Guideline* (Pasik et al., 2019) provided background for creation of the algorithm. The situation, background, assessment, recommendation (SBAR) scenarios created by Murphy and colleagues (2022) provided the inspiration and reference for the SBAR section of the tool. Both examples were adapted to create a site-specific assessment tool (see Figure 1). The completed clinical assessment tool was approved by the facility's chief hospitalist.

Next, the project chairperson worked with the unit's nurse leaders to provide education for clinical nurses. Two audiovisual educational presentations were recorded using voiceover PowerPoint®. The first module (11 minutes 14 seconds long) reviewed current evidence on asymptomatic elevated BP in the inpatient setting and potential harms associated with administration of PRN IV antihypertensive medications. The second module (5 minutes 8 seconds) presented a case study demonstrating use of the clinical assessment tool on a patient in the inpatient setting. Modules were delivered asynchronously online, with a link to the recordings distributed to nurses via email and posted to the group Facebook page. Nurses were able to view educational modules from any location at their convenience.

Following education, the clinical assessment tool was distributed to nurses on the project unit, posted at all nurse stations, and made available as a handout in the staff breakroom. The tool was trialed for 6 months.

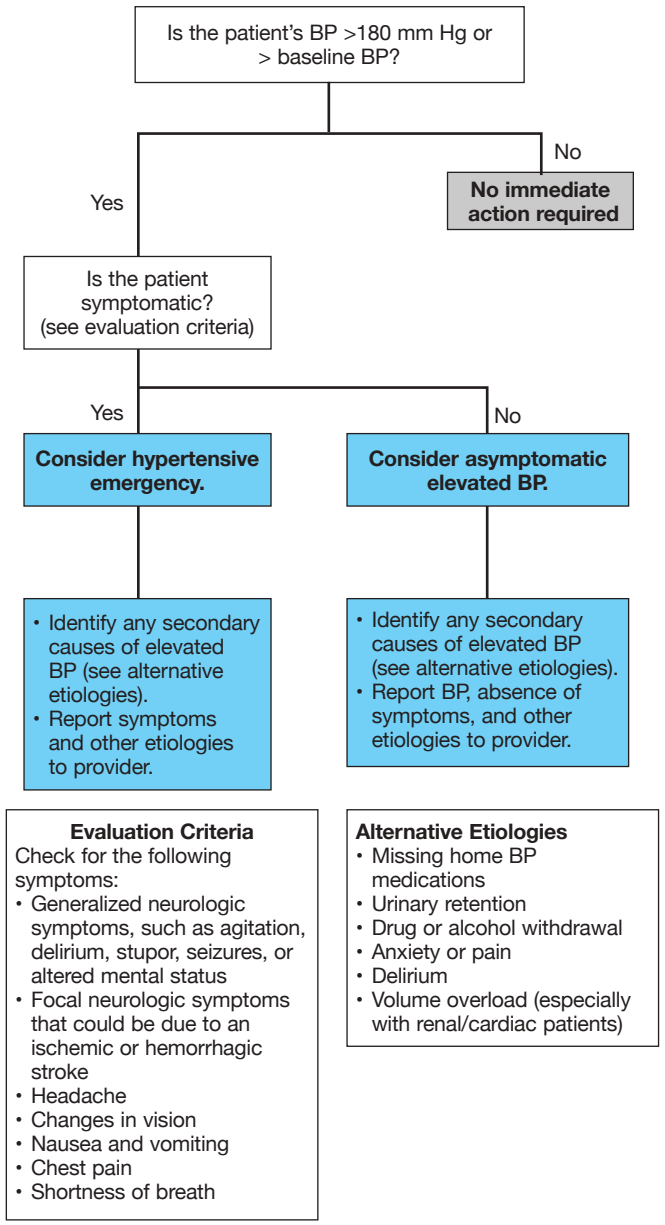
Evaluation and Action Plan

A post-implementation electronic survey was distributed to nurses on the unit to evaluate their use of and satisfaction with the clinical assessment tool. The link to the survey was sent via email and also was posted to the group Facebook page. The survey was developed specifically for the project by the project lead and team, and reviewed for face and content validity by unit leaders. It contained four multiple choice questions and two open-ended questions. The number of orders for PRN IV antihypertensive medications, specifically hydralazine and labetalol, was compared before and after the implementation. Post-implementation data were collected by pharmacy staff from the electronic medical record.

Results and Limitations

Fifteen nurses (33%) responded to the electronic survey. All respondents reported working on the unit during the entire 6-month project period. Responses demonstrated 14

FIGURE 1.
Clinical Assessment Tool for Use in Hospitalized Adult Patients with Elevated Blood Pressure



Example 1	
SBAR Report to Provider: Possible Hypertension Emergency	
Situation	I am the nurse caring for Mr. Smith in room 410. He is a 78-year-old patient admitted earlier this shift to the hospital service with a diagnosis of chest pain and NSTEMI.
Background	He called me into the room for complaints of chest pain and SOB.
Assessment	He appears pale, diaphoretic. He complains of 10/10 substernal chest pain. He has sinus rhythm on the cardiac monitor. Vital signs 36.9, 92, 24, 90% on room air, 202/110.
Recommendation	Mr. Smith has an elevated BP and is experiencing chest pain. I am concerned the patient is experiencing a cardiac emergency. I would like to obtain a STAT ECG, check troponin, and possibly administer SL NTG.
Example 2	
SBAR Report to Provider: Possible Asymptomatic Elevated BP	
Situation	I am the nurse caring for Mrs. Smith in room 438. She is a 68-year-old patient admitted to the care of the hospitalist service with a diagnosis of diabetic foot infection.
Background	During routine vital sign check, the nurse assistant obtained a BP of 188/92.
Assessment	I assessed the patient using the clinical assessment tool. The patient is asymptomatic. Physical examination is unchanged. The patient states she did not receive her daily antihypertensive medications this morning due to being off the unit in MRI.
Recommendation	Mrs. Smith has elevated BP but is asymptomatic. If appropriate, I would like to administer her daily antihypertensive medications and then reassess her BP.

BP=blood pressure, NSTEMI=non-ST-elevation myocardial infarction, SBAR=situation/background/assessment/recommendation, SL NIT=sublingual nitrogen, SOB=shortness of breath

Source: Sarah Bush Lincoln Health System. Used with permission.

(93.3%) reported encountering patients with an elevated BP in the clinical setting frequently, and 13 (86.6%) reported using the clinical assessment tool to guide the assessment of a patient with elevated BP. All respondents described feeling confident assessing a patient with elevated BP and communicating findings and recommendations to the attending provider (see Figures 2 and 3). Four respondents answered the open-ended question on barriers to implementation. One nurse reported not being aware of the protocol. Among identified barriers, three nurses identified preexisting protocols and patients already having standing orders for PRN IV antihypertensives. These nurses stated many times patients have standing orders for a PRN IV antihypertensive with parameters to administer if systolic BP was

FIGURE 2.
Post-Implementation Electronic Survey Results

Survey Item: I utilized the clinical assessment tool to guide my assessment of a patient with an elevated blood pressure in the inpatient setting.

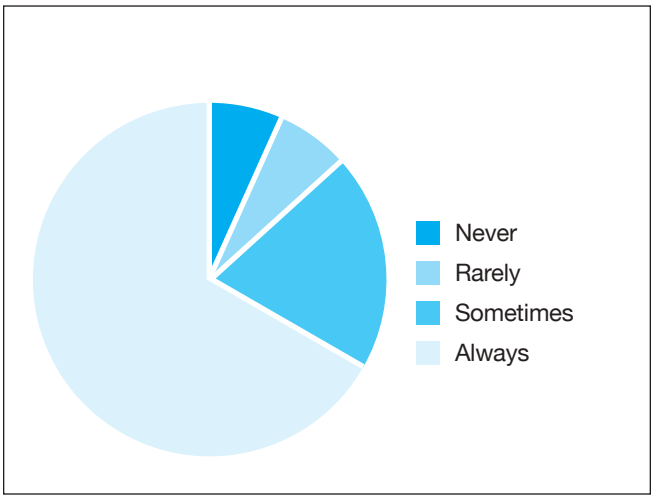
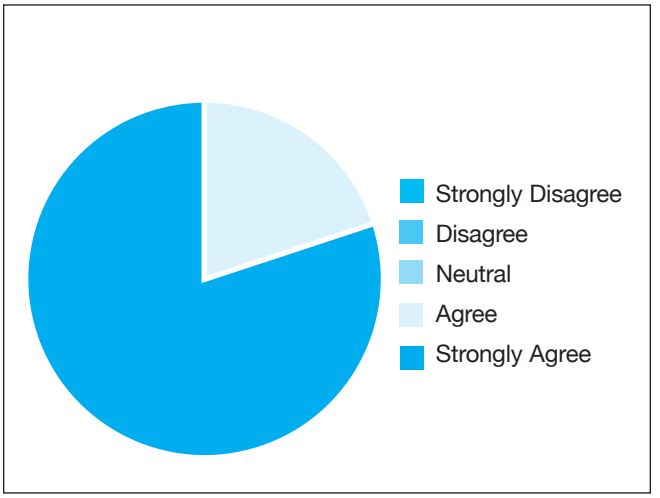


FIGURE 3.
Post-Implementation Electronic Survey Results

Survey Item: I feel confident assessing a patient with an elevated blood pressure in the inpatient setting and communicating my findings and recommendations to the attending provider.



greater than 180 mm Hg. If a patient had elevated BP but already had an order for PRN IV antihypertensive, they perceived no benefit in using the clinical assessment tool or contacting the attending provider. Only one response was provided to the open-ended question on suggested improvements. This nurse suggested additional investigation and continued use to evaluate effectiveness further.

At the conclusion of the project trial, 348 doses of IV hydralazine and labetalol had been administered on the project unit. This is compared to the 393 doses administered on the unit in the 6 months preceding project implementation, representing 11% reduction in the number of PRN IV antihypertensives administered.

Limitations of the project include not analyzing the patient population. Patient-specific or patient population factors, such as patient demographics, admitting diagnosis, and comorbidities before and during implementation were not collected or analyzed. Any change in patient-specific or patient population factors may have altered numbers. Pre-assessment of nurses on the unit was not performed. However, it would have allowed comparison of nurse-specific factors, such as confidence assessing a patient with elevated BP in the inpatient setting and communicating findings and recommendations to the attending provider. A final limitation is the low response rate of 33% on the post-implementation survey. More responses would have been useful in the evaluation phase of the project.

While no specific numeric goal was established before project implementation, nurses provided positive feedback and use of PRN IV antihypertensives decreased. Given no hospital resources were used to implement the clinical assessment tool and the strong commitment demonstrated by hospitalist providers and unit nurse leaders, there are no logistical concerns regarding future sustainability of project. The clinical assessment tool continues to be available to all nursing staff working on the unit and is distributed to new nurses orienting on the unit. A 1-hour continuing professional development opportunity was offered to all nurses at the institution to disseminate project findings.

Lessons Learned/ Nursing Implications

Nurses reported frequently encountering adult patients with elevated BP in the inpatient setting, but current pre-existing protocols and standing orders for PRN IV antihypertensives served as a barrier to providing evidence-based nursing care. Findings suggest the clinical assessment tool gave nurses a framework to effectively approach and manage a patient with elevated BP. The project also provided an opportunity to engage nurses in an evidence-based quality improvement initiative that enhanced direct patient care while also fostering autonomous evidence-based nursing practice.

The clinical assessment tool is applicable to all adults hospitalized on a medical-surgical unit and can be integrated easily into nursing practice. Potential also exists to expand use of the clinical assessment tool to other inpatients settings where nurses may encounter adults with elevated BP. Nurses are encouraged to reconsider traditional practice and instead focus on differentiating hypertensive emergency and asymptomatic elevated

BP, identifying possible secondary causes of elevated BP, and better communicating findings and recommendations to providers.

Conclusion

Despite lack of benefit, documented harms, and the presence of confounding secondary causes, PRN IV antihypertensive medications are used routinely in the inpatient setting for treatment of asymptomatic elevated BP. Providing an educational intervention and implementing a clinical assessment tool increased nurse confidence and reduced the number of doses of PRN IV antihypertensives administered on the project unit. MSN

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Clinical Practice

The Basics of Enteral Nutrition Delivery in Adult Patients for the Medical-Surgical Nurse

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Nurses play a critical role in the delivery of enteral nutrition. Incorporating evidence that drives best practices in enteral nutrition therapy accelerates quality patient care, promotes safety, and improves outcomes.

Keywords: tube feeding, enteral nutrition, medications, feeding tube, administration, complications

Learning Outcome: After completing this education activity, the learner will be able to describe best practices in the nursing care of patients receiving enteral nutrition therapy.

Enteral nutrition (EN), commonly known as tube feeding, is a vital component of nutrition therapy for patients who cannot maintain adequate nutrition by oral intake alone and have malnutrition or are at risk for malnutrition (Bechtold et al., 2022). As an important nutrition therapy for many patients in the hospital, long-term care, and at home, EN is just one of many nutrition support therapies used to treat or prevent malnutrition. In 2018, 2.4 million hospitalized adults were diagnosed with malnutrition in the United States; less than 5% of those patients received EN (Guenter et al., 2021, 2022). More recent data indicate 32.4% of hospitalized patients are malnourished, with this condition having a negative impact on patient outcomes (Guenter et al., 2021, 2023).

Indications for EN include patients with malnutrition or at risk of malnutrition who are unable to take adequate oral nutrition, including persons with critical illness, stroke, gastrointestinal (GI) diseases, cancer, cystic fibrosis, chronic obstructive pulmonary disease, and renal disease (Bechtold et al., 2022). Understanding why EN is ordered for a patient helps nurses prepare the patient and family for the intervention.

Nurses' critical role in EN delivery through prevention, early recognition, and treatment of complications has been identified for some time (DiMaria-Ghalili et al., 2016). Nurses can elevate their role by prioritizing nutrition care, while acknowledging concerns about competing orders and other tasks. For optimal nutrition care of the patient, nurses should use interprofessional partnerships, including nurse-dietitian, nurse-pharmacist, and nurse-provider.

Nurses may be uncomfortable or frustrated with EN procedures, may not have cared for a patient receiving EN in a while, and may want to review nursing protocols to manage this therapy. They need to use best practices to provide high-quality care and feel comfortable in their knowledge of EN procedures (Judd, 2020). An institution's EN protocols may be housed on the hospital intranet or in agency protocols or procedure manuals. In many institutions, nurses are required to

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review them during orientation and perhaps on an annual basis. Nurses who are unsure of EN protocols should ask the nurse educator, nurse manager, or advanced practice nurse how to access these important procedures when needed.

The purpose of this article is to highlight the basics of EN to help medical-surgical nurses optimize this nutrition therapy, prevent complications, and improve clinical outcomes.

Feeding Tubes

For many patients, a feeding tube is the only way essential nutrition, fluids, and medications can enter the GI tract. Hospitalized patients may use short-term temporary feeding tubes or long-term feeding tubes. Each tube serves a primary functional purpose and terminates in a specific anatomical location. Differentiating function and tube tip location has major implications for nursing practice and patient care.

Short-Term Feeding Tubes

Short-term feeding tubes are inserted via the nares (nasogastric [NG] or nasoenteric [NE]) or mouth (orogastric), and usually used for 4-6 weeks (Reddick et al., 2023). Blind placement involves inserting the tube at the patient's bedside without use of technology guidance. Many healthcare organizations have technology-guided enteral access systems for the safe placement of NG/NE tubes. Use of technology to guide placement at the bedside significantly reduces complications such as the misplacement of a small-bore feeding tube into the pulmonary anatomy. The tip of an NE small-bore feeding tube may terminate in the stomach (nasogastric), the duodenum (nasoduodenal), or the proximal jejunum (nasojejunal). Assessment of underlying pathophysiology, patient anatomy, aspiration risk, and GI symptoms is completed when determining the ideal location for the delivery of EN and medications.

Several verification techniques may be used to confirm tube tip placement, including x-ray, pH testing, electromagnet placement device, fluoroscopy, capnography, and direct visualization via endoscopy (Powers et al., 2021). Regardless of the method used for placement of an NG/NE tube, institutional protocol must be followed for verification of the location of the feeding tube tip. Nurses should ***not*** rely on auscultation alone as a verification method; auscultation alone is not a safe practice (Judd, 2020).

The most common complication in placement of NG tubes (particularly with blind placement) is misplacement into the pulmonary anatomy. Nurses must be astutely aware of clinical symptoms of misplacement, which may include persistent coughing, shortness of breath, decreased oxygen saturation, and unilateral chest discomfort. If misplacement of the tube into the patient's airway is suspected, the procedure should be stopped immediately, the tube should be removed, and a chest x-ray obtained. Some patients may not demonstrate obvious clinical signs of tube misplacement, however. After placement of a large-bore NG or orogastric feeding tube, the institution's protocol for tube tip verification must be followed before the tube is used.

Common post-insertion complications include tube clogging, malfunction, or dislodgement, and injury to the patient's nasal mucosa. Of these, clogging is common and occurs in up to 36% of tubes (Escuro et al., 2020). Clogged tubes lead to significant delays in the delivery of the prescribed nutrition and interrupt timely administration of medications (Klang, 2023). When enteral formula and medication mix inside the tube, a physical reaction may cause precipitation and result in an occlusive clog. Flushing the tube is required before and after administering medication, and before and after connecting and disconnecting EN (Boullata, 2019).

NG/NE tubes can cause device-related pressure injuries to the nasal mucosa and skin around the nares. As with any pressure area, vigilant assessment, pressure offloading, and early intervention are key to preventing skin impairment (Schroeder & Sitzer, 2019). Nurses should avoid taping the tube to the patient's cheek as this may contribute to skin breakdown due to constant tension of the device in one direction. Tube malfunction includes kinking, breaking, and cracking (Citty et al., 2024). A tube may fracture during an attempt to unclog it if a small syringe is used to forcefully flush the tube; a larger 30 mL or 60 mL syringe is preferred for flushing. This practice has become even more clinically significant with the transition to ENFit® connector devices. The twist-and-lock safety feature of the ENFit design does not facilitate pressure release at the syringe connection site, which may increase the risk for fracture of the tube internally at the site of the clog.

Tube dislodgement occurs in 20%-53% of tubes placed (Aeberhardt et al., 2023). Nurses should monitor how much tube is exiting the body as another safety precaution and note if the tube position changed; that is, has it been pulled out or pushed in further than expected? Use of a nasal bridle securement device significantly reduces the chances of tube dislodgement (Powers et al., 2021). If a nasal bridle securement device cannot be used to secure the tube, the tube may be taped to the bridge of the nose.

Long-Term Feeding Tubes

If a short-term tube is kept in place too long, the risk of pressure-related skin impairment or sinusitis increases (Schroeder & Sitzer, 2019). The decision to transition a patient from a short-term enteral access device to a long-term or more permanent device occurs after 4-6 weeks. Clinical decision-making includes anticipated length of EN therapy, patient disposition after tube placement, and consideration of the needs of the patient and caregivers (Reddick et al., 2023). The type of long-term enteral access device depends on how long EN therapy is anticipated, the anatomi-

cal location to which EN will be delivered (i.e., gastric or small bowel), upper GI anatomy, GI function, and risk factors associated with the type of device selected (Reddick et al., 2023).

Feeding tubes placed using endoscopic assistance are called percutaneous endoscopic gastrostomy (PEG) or percutaneous endoscopic jejunostomy (PEJ) tubes. Tubes placed using interventional radiology or a surgical approach are called gastrostomy tubes (G tubes), gastrojejunostomy tubes (GJ tubes), or jejunostomy tubes (J tubes) (Reddick et al., 2023). PEGs, G tubes, GJ tubes, and J tubes may be *standard profile* (hang away from the abdominal wall) or *low profile* (positioned flush to the abdominal wall). A water-filled *balloon* or a *non-balloon* bumper holds the tube in place internally. An external bumper prevents inward migration of the feeding tube. See examples of long-term feeding tubes in Table 1.

Complications of long-term EN devices occur during or after their placement. Hemorrhage and peritonitis are associated with placement of the device and are considered major complications. Nurses play a role in the prevention of complications after device placement, including inadvertent rupture or overinflation of the balloon, device-related pressure injuries at the stoma site, peristomal leakage, infection, inadvertent removal of the tube, and clogging (DiMaria-Ghalili et al., 2016). The sole purpose of the balloon inflation port is to inflate the internal balloon to anchor the tube in place internally. Nurses must never use the balloon inflation port for medication administration, feeding, or flushing because this may rupture the internal balloon or dislodge the feeding tube. If the internal balloon does not rupture, it becomes overinflated and may cause gastric outlet obstruction or pressure damage to the internal stomach wall. If medication has been administered into the balloon port and the internal balloon ruptures, a potentially harmful medication bolus will be administered (Malone et al., 2019).

Nurses can prevent device-related pressure injuries by closely monitoring the skin around the stoma site, especially the area underneath the feeding tube's external bumper. An external bumper that is cinched down too tightly will cause a device-related pressure injury and must be adjusted to relieve pressure. Nurses can collaborate with the medical team to assess the external bumper and recommend adjustments be made if the bumper is too tight (Akcay et al., 2023).

A leaking stoma will cause skin irritation at the stoma site; leaking may occur if there is excessive movement of the tube within the stoma tract. Nurses must assess and address any leaking promptly to prevent prolonged exposure of healthy skin to gastric secretions. Stabilizing the tube with an enteral tube securement device or tape will help minimize movement within the tract. Nurses must collaborate with the medical team and a wound care nurse if leaking occurs to determine appropriate interventions, which include assessment of the device and stoma, re-inflation of the internal balloon if deflated, stabilization of the tube, and application of a moisture barrier cream to protect the healthy surrounding skin. Leakage from the stoma tract increases the risk for infection. Vigilant assessment promotes early recognition of signs of bacterial or fungal infection. Nurses should assess for erythema, induration, pain, drainage, and odor at the stoma site. Promptly discussing any findings with the medical team promotes early intervention and appropriate management of localized stoma tract infection. Treatment ranges from use of a topical antibacterial or antifungal to systemic antibiotics (Akcay et al., 2023).

Urgent attention to the inadvertent removal of a long-term feeding tube is necessary to prevent stoma tract closure. When caring for patients in the hospital setting, nurses must take care to prevent inadvertent removal of long-term feeding tubes; if dislodgement occurs, the medical team should be notified promptly. Nurses must assess the long-term feeding tube stoma site during physical assessment and after routine care, such as turning and repositioning. If the tube has been dislodged, securing the stoma tract becomes a priority; a trained and experienced provider may do this at the bedside by placing an appropriately sized urinary drainage catheter into the stoma tract as a temporary measure (Malone et al., 2019).

As with short-term tubes, clogging is a common complication with gastrostomy and jejunostomy tubes. Contributing factors include longer tube length, smaller French size, frequent checking of gastric residual volumes, improper medication preparation, and inadequate flushing (Escuro et al., 2020). Routine flushing with water using a 60 mL syringe helps to maintain tube patency; nurses should refer to institution protocols for recommended water flush volume. Other strategies to unclog enteral gastrostomy or jejunostomy tubes include gently massaging the tubing or using an enzymatic de-clogging solution; mechanical dislodgement of the clog can be done by a trained provider. When gastrostomy or jejunostomy tubes become clogged and standard de-clogging methods fail, the tube will need to be replaced.

Enteral Nutrition Administration

Administration of EN requires several steps to ensure quality, accuracy, and safety. Nurses begin by verifying the order and rationale for the feeding. When reviewing the order, nurses anticipate specifics that include formula with strength as well as route, rate, and method of delivery.

Many institutions carry a variety of enteral formulas. The registered dietitian (RD) is a valuable resource in determining a patient's appropriate formula. In some institutions, nurses can use RD-developed standing orders when a patient needs EN and the RD is not readily available for a consultation. The formula may

TABLE 1.
Types of Long-Term Feeding Tubes

Tube Type	Anatomical Location	Method of Placement	Primary Function	Characteristics
Low Profile Balloon low profile*  Non-balloon low profile* 	• Gastric • Jejunal • Gastrojejunal	• Endoscopic • Fluoroscopic • Surgical	• Enteral feeding • Medication administration • Hydration • Decompression	• Also known as a "button" • Fits snug to the abdominal wall • Often referenced by brand names MIC Key®, Mini One® • Requires attachment of a feeding set adapter, which may be removed when not in use
Gastrostomy (G) Balloon G tube* 	• Gastric	• Endoscopic • Fluoroscopic • Surgical	• Enteral feeding • Medication administration • Hydration • Decompression	• French size, length vary based on feeding tube indication, patient anatomy. • Larger-sized tubes are selected for drainage or venting. • Tube is positioned into the stomach through a small tract or stoma. • Anchored internally with a mushroom- or flat-shaped internal bumper (non-balloon PEG) • Anchored in place internally with a water-filled balloon (balloon G tube)

*Image provided courtesy of Applied Medical Technology, Inc.

continued on next page

TABLE 1. (CONTINUED)
Types of Long-Term Feeding Tubes

Tube Type	Anatomical Location	Method of Placement	Primary Function	Characteristics
Gastrostomy (G) Non-balloon G tube* 				
Gastrojejunostomy (GJ) Low profile GJ tube*  Standard profile GJ tube* 	• Gastric • Jejunal	• Endoscopic • Fluoroscopic • Surgical	• Enteral feeding • Medication administration • Hydration • Decompression	• Dual lumen feeding tube • Gastrostomy portion terminates in the stomach. • Jejunostomy portion passes through gastrostomy port, advances into the jejunum.

*Image provided courtesy of Applied Medical Technology, Inc.

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TABLE 1. (CONTINUED)
Types of Long-Term Feeding Tubes

Tube Type	Anatomical Location	Method of Placement	Primary Function	Characteristics
Jejunostomy** 	• Jejunal	• Endoscopic • Fluoroscopic • Surgical	• Enteral feeding • Medication administration • Hydration	• Size, length may vary; tube may be standard or low profile. • Anchored internally with water-filled balloon (balloon PEJ) or mushroom-shaped internal bumper (non-balloon PEJ) • Direct jejunostomy bypasses the stomach. • Effective enteral access device for patients who do not tolerate feeding into the stomach or have a history of recurrent aspiration events

PEG=percutaneous endoscopic gastrostomy, PEJ=percutaneous endoscopic jejunostomy

**Image used with permission from Avanos Medical.

be packaged as a powder to be reconstituted, or as a liquid stored in a can or bottle, or supplied as a ready-to-hang container (Church & Zoeller, 2023). The exact preparation of each formula is described by the manufacturer. If the formula is a powder or liquid in cans or cartons, it will need to be delivered with an open system feeding bag and tubing set. After formula is poured into the feeding bag, the remaining unused portion should be dated and stored in a refrigerator. Open systems (enteral bags with cap lids) allow nurses to refill the bag as the formula is administered. However, caution must be taken not to place more than 8 hours of formula in the bag at any time; the bag must be discarded after 24 hours. Conversely, closed systems can hang 24-48 hours, including pre-filled ready-to-hang containers that then are spiked with the feeding set and are not otherwise manipulated (Malone et al., 2019). In addition to the formula, water must be administered to meet patient fluid needs and reduce clogging risk. A separate water bag often is incorporated into the feeding system so water boluses can be administered during the feeding period (Zoeller et al., 2020).

After formula is prepared and the delivery system is assembled, labeling the feeding bag is essential. This step serves as a form of communication between providers and across shifts. The labeling process also creates a pause to verify the order before administration. Common key elements of labeling include patient identifiers, formula, delivery site, administration method, administration rate, date of hanging, and expiration time (Schwarz et al., 2024).

After the order is verified and the bag is labeled, the tubing is primed to remove excess air that might cause patient discomfort during administration. Before connecting the feeding bag tubing to the patient, nurses confirm an ENFit device is secured to the end of the tube. ENFit is a safety feature used to reduce the risks of erroneously misconnecting the feeding bag tubing to a non-enteral tube (Global Enteral Device Supplier Association, n.d.). With the above steps satisfied, nurses confirm the delivery method. Although administration through a continuous infusion pump is the most common method used in the hospital, gravity drip and bolus methods may be ordered. Infusion time and rates are noted, as well as specifics about total volume or rate advancement (Schwarz et al., 2024).

Delivering the prescribed volume of enteral formula often is challenging. With patients leaving the unit for procedures or moving around the unit with therapists to address rehabilitation needs, patients may be disconnected from EN for long periods of time. Although stopping EN should be avoided because of involved risks and nutritional gaps, volume-based feeding is a strategy to increase the likelihood of full-volume delivery (Holyk et al., 2020). Typically, EN administration involves a set rate over a defined time. However, in consultation with an RD, nurses may consider volume-based feeding. Volume-based feeding focuses

on the total amount prescribed over a 24-hour period and the rate is adjusted to meet the volume. For example, the patient is prescribed 2000 ml per day at 100 ml per hour. There are 8 hours left in the day with 1000 remaining in the bag, leading nurses to increase the hourly rate to 125 ml to ensure the total volume is administered (8 hours x 125 ml/hour=1000 ml). Holyk and co-authors found volume-based feeding to be well tolerated by patients and superior in achieving nutritional goals.

With the delivery method and volume established, nurses prepare the patient for enteral feedings. Using best practice, they position the patient with a 45-degree backrest elevation to reduce risk of aspiration and other complications. However, in unique circumstances, such as a patient who is at high risk for a sacral pressure injury, the healthcare provider may choose a lower backrest elevation of 30 degrees. Each patient must be evaluated for appropriate safety measures and monitoring practices.

Frequent assessments include tolerance to the feeding through evaluation of symptoms, such as diarrhea, vomiting, abdominal distention, or bloating. However, assessing gastric residual volume (GRV), once considered a hallmark of monitoring, is no longer recommended as routine practice. Studies vary on the necessity of obtaining GRV as well as benefits of the interventions. In a Cochrane review, Yasuda and co-authors (2021) found uncertain evidence about the effect of GRV on clinical outcomes, including mortality, pneumonia, vomiting, and length of hospital stay. A best practice is to engage the healthcare team in discussion of risks and benefits of obtaining GRV, particularly in a patient with a suspected delay in gastric emptying.

Closely monitoring the enteral tube to verify proper placement and reduce complications is also a mainstay of care. With each initiation of feeding and at regular intervals throughout the shift, the nurse assesses the tube location and the health of the skin surrounding the tube. Lastly, nurses frequently evaluate the success in achieving goal feeding volumes, monitoring the patient receiving EN administration, which is a constant, cyclic process performed to ensure quality, accuracy, and safety.

Enteral Nutrition Complication Prevention and Treatment

As an important form of nutrition support, EN is not without challenges for the nurse and possible GI and metabolic complications for patients. Some of the more common GI complications include abdominal distention, pulmonary aspiration, malabsorption/maldigestion, diarrhea, and constipation. GI complications frequently lead to interruptions in EN delivery (Blaser et al., 2021).

Many attempts have been made to define abdominal distention empirically, but the most practical way to assess a patient for distention is to inspect and palpate the abdomen. When patients describe feeling distended, accompanying symptoms often include cramping and bloating. Reasons for distention include ascites, diarrhea, GI ileus, obstruction, or obstipation (Blaser et al., 2021).

Pulmonary aspiration occurs when material accidentally enters a patient's airway and goes into the lungs. Prevalence of aspiration pneumonia in patients with tube feeding is 45%-95%, with a mortality rate of 17%-62% (Elmahdi et al., 2023). To minimize risks of aspiration in the inpatient hospital setting, elevating the head of bed to 30-45 degrees during gastric feeding will decrease reflux of gastric contents and risk of aspiration pneumonia.

Clinical nurses should assess patients' nutritional status by questioning any unexplained weight loss, abdominal pain, bloating, flatulence, or diarrhea. These may indicate issues with malabsorption, which involves defective mucosal uptake and transport of nutrients or water from the small intestine. Knowing the patient's medical history before starting EN may help the provider select an appropriate formula and prevent malabsorption or maldigestion (Blaser et al., 2021).

Diarrhea is one of the most commonly reported side effects of EN; the incidence of diarrhea in enterally fed patients ranges from 2%-75% (Blaser et al., 2021). Not only can diarrhea lead to underfeeding patients, but persistent diarrhea can lead to a poor quality of life for hospitalized patients. Diarrhea in patients with tube feeding may have many causes, including an infectious or inflammatory process, hyperosmolar or sorbitol-containing liquid medications, or a hyperosmolar or fiber-free EN formula (Blaser et al., 2021). If a medication is given jejunally, the medication will need to be diluted properly with water to ensure no dumping-like syndrome will occur (Boullata, 2021). Assessing medications, excluding possible infection, and possibly changing formulas in conjunction with the healthcare team can improve these symptoms.

Constipation is defined as the accumulation of excess waste in the colon, often up to the transverse colon or even the cecum (Hay et al., 2019). If not expelled timely, the stool burden can worsen and lead to impaction. The patient may have liquid stool around an impaction. Constipation may be caused by certain medications, inadequate fluid intake, inadequate fiber, or lack of physical activity. Hay and co-authors suggested review of medications, provision of adequate fluid, use of a fiber-containing formula, provision of laxative medications, and encouragement of physical activity may help with constipation prevention and resolution. An abdominal x-ray may be needed.

Metabolic complications include hyperglycemia and alterations in electrolyte and mineral levels. These are particularly common when patients lose GI fluids with diarrhea and high ostomy output. Monitoring intake and output and metabolic laboratory results, and replacing fluid, electrolytes, and minerals are essential (Malone et al., 2019).

Medication Administration through Feeding Tubes

Delivery of medications for patients with a feeding tube can be complex and challenging. The underlying clinical need for a feeding tube frequently makes it necessary to deliver medications through the enteral access device. Incorrect medication administration methods may result in clogged feeding tubes, decreased drug efficacy, increased adverse effects, or drug-formula incompatibilities (Boullata, 2021).

Successful enteral medication administration depends on an interprofessional team approach to determine feasibility of medication delivery through a feeding tube. The drug formulation must be appropriate for enteral delivery (i.e., immediate release). All involved clinicians (prescribers, pharmacists, nurses, dietitians) should be aware of the feeding entry site, distal absorption site, and tube French size to administer medications for best drug efficacy and absorption, and occlusion prevention (Boullata, 2021). Each ordered medication must be reviewed collaboratively in terms of solubility, release characteristics, osmolality, drug viscosity, and intended absorption site compared to distal tube tip placement.

Prescribing clinicians and nurses can increase medication safety by consulting with a pharmacist regarding stability, drug formulations, dispersibility, therapeutic equivalents, and drug nutrient interactions before ordering and administering medications (Institute for Safe Medication Practices, 2022; Klang, 2023). Medication formulations appropriate for delivery through feeding tubes include liquid medications as well as tablets and capsules that can be crushed. Medication forms that should not be delivered into feeding tubes include those that should not be crushed (e.g. enteric coated, modified-release, or hazardous drugs) or injectable drug forms (Boullata, 2021).

Determining if they should hold enteral feedings to allow optimal drug efficacy is a challenge for nurses. Holding the formula can result in significantly reduced delivery of nutrition and fluids. When potential interactions are a concern, strategies to prevent drug-nutrient interactions include separating the drug from feedings for an identified time, increasing the dose with continuous feeds while monitoring clinical response and laboratory parameters, or changing to an alternative therapy or delivery route (Boullata, 2021). For example, decreased warfarin (Coumadin®) bioavailability due to protein binding may occur with EN. One option to holding enteral feedings is to increase the warfarin dose and monitor clinical effectiveness. This approach can help to avoid nutrient deficits and decrease the impact on nursing workflow affected by holding and restarting the EN. As with any diet modification while taking warfarin, dose requirement may change if the EN regimen is altered.

Experts recommend holding the feeding for 30 minutes or more *only* if separation is indicated to avoid altered drug bioavailability (Boulatta, 2021; Klang, 2023). The management of drug-nutrient interactions must be individualized with consultation from pharmacists to help determine alternative treatment options and the most appropriate plan in view of patients' clinical response.

The ENFit system is designed uniquely to prevent dangerous misconnections of enteral formula and medications with other small-bore connectors such as intravenous catheters or respiratory equipment. ENFit syringes come with a standard tip and a low-dose design. The area between the male lumen and the outer ring (the *moat*) is not part of the fluid path and should be free of medication. When drawing up liquid medications, nurses should tap or flick the syringe to remove any unintended volume in the moat. Clearing the moat of the low-dose syringe for dosage accuracy is especially important for critical drugs such as opioids or cardiac medications with a narrow therapeutic index (Global Enteral Device Supplier Association, n.d.).

Nurses are generally confident they prepare and administer drugs appropriately, yet several surveys show practice varies significantly regarding medication administration (Tillott et al., 2020). The Institute for Safe Medication Practices (2022) identified the three most common inappropriate medication administration techniques through feeding tubes: mixing multiple medications together to give at once, neglecting to flush the tube before and after medication administration, and mixing medications with enteral feedings. Medications should not be added directly to enteral formula to prevent affecting the nutrient quality, compromising drug stability and bioavailability, and contributing to potential microbial contamination (Boulatta, 2021). Mixing medications together (solid or liquid formulations) for ease of administration should be avoided as this is compounding medications with unpredictable actions and no testing for efficacy or safety (Institute for Safe Medication Practices, 2022).

Understanding the complexity of medication administration through a feeding tube and following appropriate guidelines may prevent tube occlusions and drug-nutrient interactions, and decrease problems with drug efficacy and bioavailability (Boullata, 2021). Medication administration guidelines (see Table 2) are designed to help nurses reduce inconsistencies in practice, administer medications safely, and prevent or reduce complications when delivering medications through feeding tubes.

Conclusion

Nurses play a vital role in EN management, Through vigilant care, they can promote positive patient outcomes. Nurses need to be comfortable with feeding tubes, EN preparation and administration methods, EN complications, and medication delivery through feeding tubes. Use of evidence-based protocols and reliance on interprofessional partners lead to better patient outcomes. MSN

TABLE 2.
Practice Recommendations for Enteral Medication Administration

Safety Precautions (Boullata, 2021)
- Seek expert consultation.
- Verify tube tip placement.
- Verify tube patency.
- Ensure patient is sitting up or head of bed is at an angle of at least 30 degrees.
- Trace tube from point of origin before connecting any device or syringe.
- Use ENFit® enteral devices (tubes, syringes, administration, and extension sets).
- Clean mortar and pestle or other drug-crushing devices between uses to prevent environmental cross-contamination. Use self-contained pill-crushing device if possible.
- Use purified water for preparation of enteral medications (e.g., sterile water for injection, distilled water).

Medication Preparation and Administration (Institute for Safe Medication Practices, 2022)
Prepare each medication separately.

Dilute or disperse medication.
- Dissolve crushed medications in purified water.
- Create suspension in enteral syringe if drug is known to dispense readily by placing tablet in syringe with purified water and allowing it to dissolve over 5 minutes.
- Dilute liquid medications with purified water at least 1:1 ratio.
- Rinse mixing container to collect all drug particles before drawing up with ENFit syringe.

Do not add medication directly to enteral formula.

Flush tube.
- Stop feeding and flush tube with 15 mL purified water before and after each medication.
- Modify flush amounts for fluid restriction and individual needs.

Administer each medication separately.

Flush tube again.
- Use 15-30 mL water following the last medication to clear the tube and ensure the entire dose of medication was delivered.

Restart the feeding.
- Avoid delays to prevent compromising patient nutrition.
- Hold feeding 30 minutes or more only when separation is required to prevent altering drug bioavailability.

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Designing a Hybrid Chemotherapy, Biotherapy, Immunotherapy Course for the Non-Oncology Setting

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The evolving use of chemotherapy, biotherapy, and immunologic therapies in non-oncology patients poses recognizable challenges for medical-surgical nurses. When administering these therapies in non-oncology settings, nurses must be knowledgeable concerning the indication, process for administration, and safety guidelines for themselves and their patients. Nurses working in non-oncology settings should have standardized education and competence to assure safe practice (Gallegos et al., 2019; Hubbard, 2023; Siegel et al., 2024). Specialized education must include patient condition/disease (Tiong et al., 2020), prescribed agents, and their indications. Nurses must receive education concerning administration procedures and regulation guidelines (Herring et al., 2019; Hodson et al., 2023; Siegel et al., 2024; United States Pharmacopeia [USP], 2019), handling and disposal of hazardous drugs (Olsen & Walton, 2024; USP, 2019), treatment side effects, patient monitoring needs and symptom management, and patient education (Gallegos et al., 2019; Herring et al., 2019; Olsen et al., 2023).

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Knowledge of chemo/bio/immunotherapy effects is essential when caring for patients with autoimmune and other non-oncological conditions. A comprehensive, competency-based course targeted to medical-surgical nurses administering chemo/bio/immunotherapy agents was developed. Summative evaluation and decreased reported events demonstrate knowledge enhances confidence and competence.

Keywords: non-oncology, autoimmune disease treatment, safe handling, chemo/bio/immunotherapy

Literature Summary

- Administration of chemotherapy, biotherapy, and immunotherapy poses a significant hazard to nurses. Awareness is especially important for nurses working in non-oncology settings, who may not recognize or minimize the personal risk associated with these agents (Hodson et al., 2023; Miller & Toth, 2022; Olsen & Walton, 2024; Siegel et al., 2024; United States Pharmacopeia, 2019).
- Licensed independent practitioners (LIPs) and nurses, including those working in non-oncology areas, should receive comprehensive, ongoing education related to ordering and administering chemotherapy/biotherapy (Gallegos et al., 2019; Hubbard, 2023; Myers & Woolery, 2024; Siegel et al., 2024).
- Specialized education is essential to assure safe practice and provide safe patient care (Herring et al., 2019; Olsen et al., 2023).

CQI Model

Plan-Do-Study-Act (PDSA) (The W. Edwards Deming Institute, n.d.) and worksheet (Institute for Healthcare Improvement, n.d.)

Quality Indicator with Operational Definitions and Data Collection Methods

Qualitative data for satisfaction and self-evaluation were collected with each course, providing information for possible modification. Trends apparent in institutional occurrence reporting were assessed continually, along with annual competency evaluation to determine effectiveness of education and translation to safe, proficient clinical practice.

Clinical Setting/Patient Population/Average Daily Census

Medical-surgical and neurological settings in 200-bed research-driven hospital (average daily census 95-100) with three day hospitals (medical-surgical, oncology, pediatric) and 15 outpatient clinics.

Program Objectives

- Provide high-quality, evidence-based care for patients participating in clinical research.
- Develop condition-specific education and training for a low-volume/high-risk environment based on professional standards and institutional guidelines.
- Increase confidence and clinical expertise in the administration of chemotherapy and biotherapy agents as evidenced by reduction in problems, questions, and concerns supported by review of occurrence reports, trends, and survey quantitative/qualitative data analysis.

Project Site and Reason for Change

Nurses at the project site provide protocol-driven care across multiple clinical settings (inpatient, ambulatory clinics, day hospitals). Patients in non-oncology settings include persons with autoimmune, neurologic, genetic, and infectious diseases. Nurses in non-oncology settings historically received internally developed, drug-specific training as needed. When standardized courses from professional organizations such as the Oncology Nursing Society (ONS) and Association of Pediatric Hematology/Oncology Nurses (APHON) became available, the facility transitioned from an internally developed course to an age-appropriate (adult/pediatrics) standardized course. This structure continued for several years.

An increase in the use of chemotherapy/biotherapy agents in patients with autoimmune, neurologic, genetic, and infectious diseases generated questions from non-oncology nurses about the relevance of the oncology-focused courses. While courses from the specialty organizations provided information regarding safe handling based on drug classification, staff reported the drugs discussed focused on oncology indications and often did not include those administered in non-oncology units. Additionally, staff indicated use of oncology case studies and drugs was not relevant and did not advance their knowledge for non-oncology clinical practice. For example, expected treatment outcomes and potential side effects are different when a drug is administered as an antineoplastic compared to its use for an autoimmune condition, where the goal is to reduce disease symptomology without adversely affecting quality of life. Nurses perceived they spent so much time learning about drugs they did not administer that they were unable to focus or retain information relevant to their clinical practice.

Recognizing the oncology-focused professional course did not provide essential information, a workgroup of medical-surgical specialty service educators and clinical nurse specialists with expertise in chemotherapy/biotherapy was convened. The goal was to identify potential alternatives and submit a proposal to the nursing executive team assessing each option. This group surveyed clinical educators in non-oncology areas to ascertain patient populations and relevant drugs being administered in their clinical areas. The proposal outlined a comprehensive educational plan for administration of chemotherapy/biotherapy agents and monitoring of side effects for patients in non-oncology settings.

Program

Non-oncology nurses who completed standardized training as outlined above were asked to complete a self-assessment of their comfort, competency, and understanding of the administration of chemo/bio/immunotherapy agents. This included one open-ended question: "Do you feel the course you took prepared you for clinical practice?" Survey results showed staff did not feel prepared adequately for clinical practice. Additionally, nurses reported drugs and conditions discussed in the course did not align with their clinical practice. These results suggested a change was needed.

A workgroup was led by the medical-surgical service educator (SE) and a clinical nurse specialist (CNS) with more than 35 years of clinical research nursing experience and expertise in medical-surgical, oncology, pediatrics, neurology, and autoimmune/infectious diseases. Both leaders have advanced degrees and hold credentials in ONS chemotherapy biotherapy. The CNS is a provider/instructor with APHON and was an instructor with ONS before the online course conversion.

The "plan" phase of the project (Institute for Healthcare Improvement [IHI], n.d.) began with a synthesis of literature; facility policy/standards, including competency requirements; professional organizational standards (Herring et al., 2019; Olsen et al., 2023; Siegel et al., 2024); regulation guidelines (Hodson et al., 2023; USP, 2019); and condition treatment standards (Tiong et al., 2020). Benchmarking with similar facilities also was used to develop a curriculum targeted toward non-oncology patients and drugs (see Table 1). The proposal, including evaluation results, critique, lesson plan, and timeline, was approved by the National Institutes of Health Clinical Center Nursing Department Executive Team and Nurse Practice Council.

In the "do" phase of the project (IHI, n.d.), the course was piloted, revised based on feedback, and subsequently submitted and approved by the Maryland Nurses Association for nursing continuing professional development credit. The revised course would be offered four times a

TABLE 1.
Initial Course and Renewal Outline

Topic	Objectives
Principles of chemotherapy	• Recognize classifications for chemotherapy agents. • Define combination chemotherapy. • Define nadir and discuss the clinical implications.
Chemotherapy agents	• Identify at least three chemotherapy drugs given to non-oncology research participants. • Identify common side effects for individual medications. • Describe nursing assessment for chemotherapy medications.
Principles of biotherapy	• Define biotherapy. • Discuss use of biotherapy agents with radiotherapy. • Discuss targeted and hormonal therapy. • Define adoptive cellular immunotherapy. • Summarize signs and symptoms of cytokine release, tumor lysis syndrome, and discuss nursing interventions.
Biotherapy agents	• Identify agents used in non-oncology settings. • Describe indications and actions of commonly used medications. • Discuss common side effects for individual medications. • Explain essential elements of nursing assessment for biotherapy medications.
Safe handling • Review equipment, personal protective equipment (PPE)	• Describe occupational exposure risk of chemotherapy/biotherapy. • List components of safe handling and disposal practices. • Identify components of PPE.
Questions/review	End of day 1 • Answer questions from day 1. • Outline expectations for day 2.
Symptom management • Case studies with response technology	• Identify five systemic side effects of chemotherapy/biotherapy. • Discuss two ways to prevent or treat the five identified systemic side effects.
Participant presentations • Case study, from area of interest or population and treatment relevant to clinical practice	• Present case study. • Review additional conditions. • Discussion: targeted to enhance understanding of various conditions, patient populations, and drug-specific symptom management.
Clinical scenarios/skills practice	• Review key clinical precautions when administering chemotherapy/biotherapy. • Hands-on skill stations ◦ IV administration ◦ Oral administration ◦ Subcutaneous administration ◦ PPE ◦ Chemotherapy spill cleanup ◦ Worksheet station
Questions/review	• Answer questions, summarize key information.
Exam	• Open-book, 40 questions
Review exam	• Final discussion and questions
Evaluation	• SurveyMonkey® used to create Likert scale response, with open-ended response/comment boxes for each question.

Note: Online renewal course content has similar structure with focus on updates, policy changes, and trends.

year. As outlined in the Clinical Center Nursing Department standard of practice, all nurses demonstrating competence in chemotherapy/biotherapy would be required to take one approved initial course for competency validation: the course as described, ONS/Oncology Nursing Certification Corporation (ONCC) chemotherapy immunotherapy certificate course, or APHON Chemotherapy/Biotherapy Provider Course.

Evaluation and Action Plan

In the "study/act" phases of the project (IHI, n.d.), course evaluations and open-ended responses were reviewed for participant satisfaction and understanding. Voluntary feedback from participants reflected an appreciation for collaboration as well as respect for professional attributes, colleague relationship, perseverance, and ability to laugh with fellow participants. This helped the course become an integrative, standardized program that meets the needs for the organization. New protocol implementation occurs on a regular basis at this research facility. The clinical educator team shares updated information with course facilitators, allowing curriculum updates in the renewal course to be shared with staff during competency revalidation. Additional updates and course revisions are based on policy or government standard changes related to safe handling of hazardous drugs (e.g., USP 800; National Institute for Occupational Safety and Health). Review includes analysis of evidence-based literature and professional organizational changes/standards (Herring et al., 2019; Hodson et al., 2023; Olsen et al., 2023; Tiong et al., 2020); evaluation of new research protocols (e.g., drugs or conditions new to practice); annual survey of clinical educators to ascertain content relevance (drug therapies to be added, revised, or deleted); and review of summative evaluation data.

In the second year, course designers recognized the need to provide a standardized renewal process consistent with professional organizational format (e.g., ONS provider renewal, APHON provider renewal). Again based on the "plan/do" stages of the project (IHI, n.d.), a renewal course was developed using the format in Table 1 as a template and focused on new and updated information. Content was conceived as a hybrid online renewal process in conjunction with competency revalidation, ensuring congruence with expectations of professional organizations. The initial and renewal course curricula were implemented and evaluated over the next 7 years using repeated PDSA cycles. During the evaluation phase, course curriculum analysis included a post-course knowledge assessment and summative evaluation with participant feedback. Recommendations were incorporated in course revisions.

Results and Limitations

The first objective of the program was to provide high-quality, evidence-based care for patients participating in clinical research. An ongoing process involving annual literature review, benchmarking with colleagues and other institutions, and updating institutional policies/standards of practice have been incorporated into the course. In keeping with nursing department strategic goals of assuring clinical research and patient care goals are met, and safe optimal clinical outcomes are achieved, the revised initial and renewal course for Chemotherapy Biotherapy for Non-Oncologic Settings standardizes delivery of care for clinical research nurses in non-oncologic areas. It also creates a mechanism for institutional revalidation. This ongoing process will maintain content applicability for individual clinical settings and ensure course sustainability. Initial post-course and renewal evaluation along with ongoing verbal feedback from staff have shown increased comfort with providing patient education. This also is demonstrated in periodic audits of electronic medical record documentation.

The second program objective was to develop condition-specific, relevant, targeted education and training for a low-volume/high-risk environment based on professional standards and institutional guidelines. Non-oncology clinical nurses administering chemotherapy/biotherapy in a non-oncology setting (inpatient, day hospital, outpatient setting) were required to complete training. To date, 283 nurses have completed the initial course and 339 the renewal. They provided feedback via Likert scale and open-ended evaluation as well as verbal discussion throughout the course. Satisfaction survey results ranged from 4.6 to 4.8 (Likert scale 0-5). Examples of qualitative data included the following comments: "I really enjoyed the interactive sessions that allowed for knowledge exchange and reduced the monotony that can occur with lectures." "This course is preferred because we discussed drugs and conditions that are relevant to my practice."

The third objective was to increase confidence and clinical expertise in the administration of chemotherapy/biotherapy agents. As the number of nursing staff who completed the course increased, overall competence and comfort using resources improved. Nurses often were able to discuss their questions and needed clarifications proactively with peers, leaders, and research team members to achieve resolution. As competence increased, questions elevated to the SE or CNS changed from skill-related concerns to more advanced questions seeking clarification from the research team or leader support in resolving protocol-related concerns. Course participants have expressed feeling empowered to ask questions, provide feedback, conduct patient education, advocate when patients have additional questions, fully collaborate in maintaining protocol integrity, and interact with members of the medical/research teams. With increased competence, they become an integral part of discussions with the research team regarding protocol implementation and during patient

care rounds. Nurses who had completed an oncology-focused chemotherapy/biotherapy course, compared to the internally developed course for the non-oncology nurse audience, frequently expressed appreciation for the relevance of content adaptations and application to non-oncology patients. Nurse confidence and competence have improved as evidenced by the summative evaluation and a decrease in reported events.

Lessons Learned/ Nursing Implications

During the COVID pandemic and because of ongoing excellent collaborative efforts of the CNS and SE, the course was recreated to be an interactive virtual presentation. The enhanced virtual experience implemented audience participation devices, such as multiple choice, "hot spots," word scrambles, and knowledge checks. Animated discussions were facilitated by case studies to elicit question-and-answer sessions. Video, pictures, and clinical exemplars were incorporated to stimulate discussion and learning. Participant engagement was enhanced using camera and audio equipment. Humor, understanding, and compassion were essential. Knowledge was assessed through an open-book, 40-question multiple choice test. Questions were developed to assess critical thinking as well as comprehension of material. Test integrity was maintained by using breakout rooms and one-to-one student/facilitator interaction. Responses to questions were reviewed with respect and discussion regarding the nurse's thought process to address any additional learning needs and confirm understanding. This discussion also was used to provide facilitators with feedback regarding individual questions and content delivered. The desired outcome for course participation remains understanding, comprehension, and the ability to apply this knowledge to administer chemotherapy/biotherapy with safety and competence.

After the post-COVID transition from an online/virtual course to in-person classroom, many of the pandemic strategies and tools were retained. For example, the symptom management section worked very well when presented as case studies with audience response questions; participant presentations facilitated robust discussions as well as provided insight into clinical practice on other units. Portions of the didactic content were well received as self-study (i.e., review of immune system, disease conditions) and subsequently served as resources to participants after the course. The self-study information also was helpful as a resource for participant case presentation. This approach removed the "sage on the stage" and facilitated "guide on the side" (King, 1993). Moving the review of the immune system and disease conditions online allowed additional classroom time for a hands-on skill session and experiences.

Conclusion

Providing content relevant and meaningful to the target audience in a safe atmosphere where all questions are welcomed improved participation, learning, retention, and engagement. Nurses have referred to this course as "fun" and "meaningful." This description validates the educational methods, delivery of content, and the ability to address varying learning needs of a diverse audience. Competence leads to positive patient outcomes. This comprehensive course has achieved the desired outcomes of this program, and with continued review and update, will ensure sustainability. MSN

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Evidence-Based Practice

Evaluation of a Fall Prevention and Control Innovation

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Akhiwu, E.A., Brennan-Cook, J., Wright, Jr., C.D., & Cary, M.P. (2024). Evaluation of a fall prevention and control innovation. *MEDSURG Nursing, 34*(1), 39-43. https://doi.org/10.62116/MSJ.2025.34.1.39

Inpatient falls are common and concerning. This project evaluated the effectiveness of educating patients, families, and staff on fall prevention and control strategies. Although the fall rate did not change significantly in the 3 months after intervention, significant improvement in staff adherence to fall prevention strategies was noted.

Keywords: fall prevention, patient education, staff education

Learning Outcome: After completing this education activity, the learner will be able to discuss the effect of a patient and staff education program on the incidence of patient falls.

Hospitalized patient falls occur frequently and remain a major global healthcare concern despite various evidence-based strategies for identifying specific fall risk factors, preventing falls, and engaging hospital managers (Bowden et al., 2019; LeLaurin & Shorr, 2019; World Health Organization, 2021). Inpatient falls are more prevalent among adults and older adults (Moreland et al., 2020). Some 700,000 to 1 million hospitalized patients fall annually (Agency for Healthcare Research and Quality, n.d.; Patient Safety Network, 2019; Stocking et al., 2021). Inpatient falls result in significant physical and economic burden, such as injuries; decreased quality of life; and increased morbidity, mortality, length of hospital stay, and medical care costs (Centers for Disease Control and Prevention [CDC], 2020; Francis-Coad et al., 2020; Stocking et al., 2021).

Falls by hospitalized patients place a substantial financial burden on the nation's healthcare system, especially falls among adults age 65 and older. Approximately $50 billion are spent yearly on medical costs related to non-fatal fall injuries, and $754 million are spent on medical costs related to fatal falls. These expenses are expected to rise as the number of Americans age 65 and older increases (Haddad et al., 2019). The CDC (2020) reported the annual spending on non-fatal falls as follows: Medicare $29 billion, Medicaid $9 billion, and private or out-of-pocket payers $12 billion. As of October 2008, the Centers for Medicare & Medicaid Services no longer reimburse hospitals for costs related to inpatient falls, leaving the financial burden on patients and hospitals (as cited by LeLaurin & Shorr, 2019).

Project Site and Reason for Change

Despite existing fall prevention strategies on the project unit, reported inpatient falls continued. Fall prevention strategies consisted of positioning hospital beds at their lowest level, ensuring the call light was within each patient's reach, providing non-skid socks to all patients, applying a fall risk wristband to identified patients, using bed or chair alarms, performing purposeful rounding on patients, completing a fall risk assessment, and completing the Bedside Mobility Assessment Tool (BMAT) assessment on all patients. However, adherence to these fall preven-

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Clinical Question

Among adult patients in medical-surgical unit (P), how does a patient and staff education intervention (I) compared to current fall prevention strategies (C) affect incidence of falls (O) in 3 months (T)?

EBP Model

Iowa Model of Evidence-Based Practice (Buckwalter et al., 2017)

Patient Outcome

Reduce patient falls by 50%. For this project, *fall* was defined as an event that results in a person coming to rest inadvertently on the ground, floor, or other lower level (World Health Organization, 2021).

Search Strategy and Results

Key words used for the search were *fall*, *falls*, *prevention*, *control*, *education(s)*, *patient(s)*, *hospital*, *inpatient*, *med-surg*, *medical-surgical*, *staff*, and *nurse(s)*. Filters applied for inclusion and exclusion were adults, English language, and publication in 2018-2023. After application of filters, 83 articles were located in PubMed, 48 in CINAHL, and 37 in Scopus. About 40 articles were most relevant for this evidence-based quality improvement project and 15 articles were used. The remaining four articles used for this project were cited in other selected articles.

Databases

PubMed, CINAHL, Scopus

Clinical Setting/Patient Population/Average Daily Census

41-bed medical-surgical unit (291 adult patients admitted per month) in a 204-bed hospital in the southeastern United States

tion strategies was inconsistent. An evidence-based quality improvement (EBQI) project was needed with re-education of staff members and patients on existing fall prevention strategies. This project was deemed institutional review board exempt.

Summary of Literature Search

Evidence shows staff and patient education is key to successful fall prevention and control (Bargmann & Brundrett, 2020; Heng et al., 2020). Fall prevention programs with education components for nursing staff and patients, especially for older adults, resulted in positive outcomes (Ojo & Thiamwong, 2022). Bargmann and Brundrett (2020) reported an overall increase in adherence to existing fall prevention strategies after educating staff and patients.

Educating healthcare team members, such as registered nurses and certified nursing assistants, on patient fall prevention led to more consistent use of existing fall prevention strategies (e.g., bed/chair alarms, arm bracelets, non-slip socks) and decreased incidence of patient falls (Morris et al., 2022). Tiedemann and co-authors (2021) reported a significant improvement in participants' knowledge, behavior, and confidence in fall prevention practices after staff education programs on fall prevention. It was deemed important to involve all staff in fall prevention training. However, most hospitals provide education at orientation only and few hospitals include non-nurse staff (Turner et al., 2020).

Inpatient fall prevention interventions, including patient empowerment through education and involvement, have reduced hospital falls (Heng et al., 2020). Bargmann and Brundrett (2020) reported patient involvement through education and staff-patient agreement significantly decreased the fall rate and increased staff adherence to existing fall prevention strategies in a medical-surgical unit. According to Dykes and colleagues (2020), implementation of patient-centered fall prevention strategies that routinely engage patients and their families in fall prevention plans reduced fall rates and fall-related injuries. LeLaurin and Shorr (2019) also reported a multifactorial intervention that included patient education was effective in fall prevention. In a recent meta-analysis, patient and staff education also was highly effective in reducing hospital falls compared to the use of traditional interventions, such as bed alarms, chair alarms, and wearable sensors (Morris et al., 2022).

Answer to the EBP Question

Evidence shows combining fall prevention strategies with education of staff, patients, and their families is most effective in promoting adherence and reducing falls rate (Dykes et al., 2020; LeLaurin & Shorr, 2019; Morris et al., 2022). This EBQI project consisted of an educational intervention for two groups. Staff were re-educated on existing fall prevention strategies and their role in preventing falls. Patients and their families received education on their role in fall prevention. Involving patients and their families in fall prevention education is patient-centered care that empowers patients and provides them with a sense of belonging (Heng et al., 2022).

Implementation of the Change in Practice

The project site had an existing fall prevention policy. However, nurse leaders identified lack of adherence among care team members. They required every care team member on the unit to be included in this project. The first author of this article performed literature

TABLE 1.
Staff Adherence to Fall Prevention in Electronic Health Record

Month	Falls Assessment	Bed/Chair Alarm	Purposeful Rounding	BMAT	Total Number of Patients
Pre-Innovation					
May	202 (71.89%)	264 (93.95%)	256 (91.10%)	276 (98.22%)	281
June	222 (75.25%)	272 (92.20%)	264 (89.49%)	293 (99.32%)	295
July	218 (74.15%)	280 (95.24%)	273 (92.86%)	290 (98.63%)	294
Total	**642**	**816**	**793**	**859**	**870**
Post-Innovation					
August	258 (86.58%)	295 (98.99%)	293 (98.32%)	298 (100%)	298
September	251 (85.96%)	287 (98.29%)	284 (97.26%)	291 (99.66%)	292
October	260 (89.97%)	285 (98.62%)	284 (98.27%)	289 (100%)	289
Total	**769**	**867**	**861**	**878**	**879**

BMAT = Bedside Mobility Assessment Tool

reviews and developed patient and staff re-education strategies using the hospital's existing policy, which were approved by the unit manager. Primary aims were to reduce patient falls on the project unit, and increase patients' and care team members' knowledge of and adherence to existing fall prevention strategies 3 months after project implementation.

Staff re-education consisted of a 2-minute in-service during weekly huddles to review current fall prevention strategies, including a reminder that all care team members have a role in fall prevention. These brief huddles were conducted by the first author, the unit manager, and charge nurses for 3 months. Key points from the posters (described below) were included in the review. To reach most staff members on the unit, weekly huddles were conducted on different days of the week and early in the morning to enable participation by day and night shift staff members. Also, PowerPoint® materials and reminders were sent to every unit staff member by email.

Posters with key points for staff regarding existing fall prevention strategies were developed by the first author and displayed at the computer stand in each patient room, nurses' station, and staff lounge. Each poster contained five evidence-based strategies (Morris et al., 2022) for fall prevention that had not been implemented consistently on the unit. The catchphrase "Together we can SCRAP falls" appeared on the posters, with each letter reminding staff of the strategies:

S – encourage use of non-skid **Socks** for all patients.
C – place **Call light** within the patient's reach.
R – perform purposeful **Rounding**.
A – turn on bed/chair **Alarm**.
P – ensure beds are in the lowest **Position**.

Patient education posters were developed by the first author, written in English and Spanish, and contained three key points specific to patients' role in fall prevention: using the call light, asking for help to get out of bed, and wearing non-skid socks. Staff were involved in placement of posters to remind patients of their role in fall prevention.

A seven-slide educational PowerPoint reviewing current fall prevention strategies was developed by the first author and emailed to all unit staff members by the unit manager. This presentation contained pictures of the posters with key points of the unit's existing fall prevention strategies, as well as reminders to educate patients. Copies of the PowerPoint also were printed and distributed to staff during huddles. Related pre-education and post-education Qualtrics surveys were provided to evaluate staff knowledge of current fall prevention strategies.

Evaluation of the Initiative

Monthly patient falls pre-intervention (May, June, July) and during the 3-month project (August, September, October) were compared. The staff outcome was evaluated using the same pre- and post-education survey from the PowerPoint. Staff members were instructed to complete the pre-education survey before the presentation; the post-education survey was completed at the end of the presentation. Participants' knowledge scores were compared.

Team members' adherence to the unit's existing fall prevention strategies for fall risk assessment, use of bed and chair alarms, purposeful rounding, and BMAT assessment were obtained from electronic health record review and reported as a percentage before and after intervention (see Table 1).

Results and Limitations

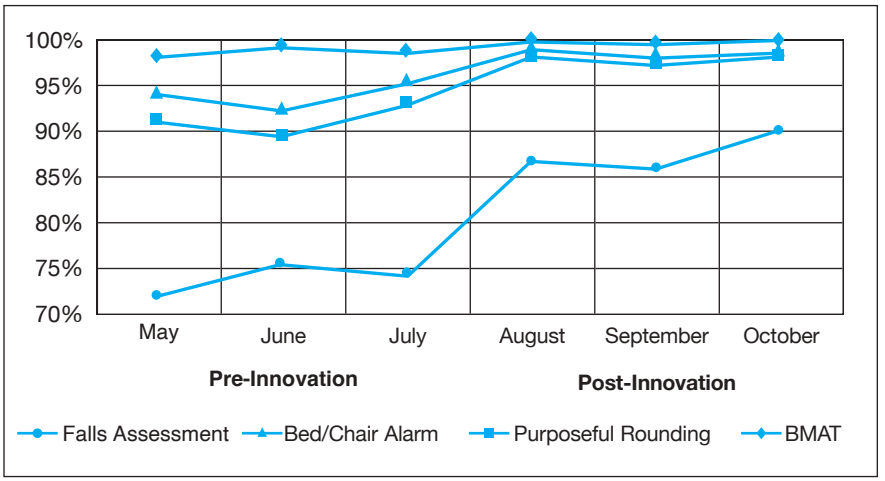
Fall rate in the 3 months pre-implementation was 0.9% (eight falls in 870 patients); overall post-intervention fall rate was 1.0% (nine falls in 879 patients). A Fisher's exact test showed no significant difference in fall rates (p=0.999). Anecdotal staff comments during huddles indicated patients fall despite continual reminders. One patient tripped when dressing in pajamas; one patient spilled water and promptly slipped and fell. In addition, a few confused patients had trouble following directions, while some patients refused to wear non-skid socks or agree to use of bed alarms.

According to LeLaurin and Shorr (2019), current fall prevention strategies may not be effective or even practical. For example, encouraging use of alarm systems may not be effective in fall prevention because alarms may be disruptive to patients with cognitive impairment, contributing to patient falls. Non-skid socks may slip and twist, contributing to falls or possible infection if not changed. Developing patient-centered individual plans of care to prevent falls, based on individual risks, may result in reduced fall rates in this setting (Dykes et al., 2020).

Results of staff knowledge surveys regarding existing fall prevention strategies were inconclusive. Although 15 participants started the surveys, only seven staff members completed both the pre-education and post-education Qualtrics survey. Due to the small sample, a Wilcoxon signed-rank test was conducted to compare pre- and post-presentation scores. With a maximum score of 100% for the seven-item test, the median score pre-intervention was 85.71% (six correct items); it improved to a median of 100% at post-intervention (p=0.023). Six participants improved on measures, and one participant had no change in knowledge scores. Data from eight incomplete surveys were disqualified. Organizational factors and lack of time to complete the surveys may have contributed to reduced staff participation in the educational surveys (Heng et al., 2022). Possible contributing factors to low participation included time constraints and failure by some staff to read their emails. In addition, many newer staff members who were adapting and learning their roles may not have prioritized survey completion. Although educational PowerPoints were sent twice to all staff members with reminders to complete the surveys and staff members were reminded during weekly huddles with distribution of printed PowerPoint presentations, participation in knowledge survey completion was less than expected.

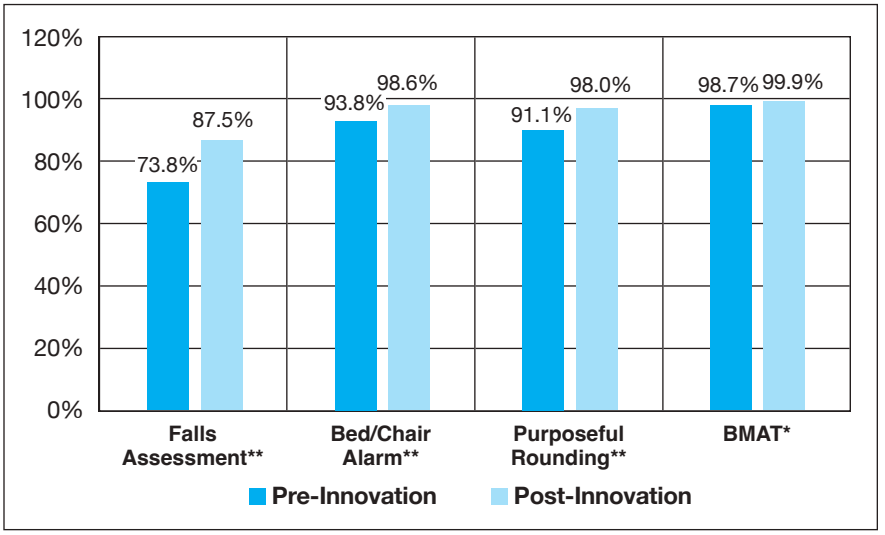
Staff adherence rates for each fall prevention element (fall risk assessment, use of bed and chair alarm,

Figure 1.
Staff Adherence Rates by Month



BMAT=Bedside Mobility Assessment Tool

Figure 2.
Overall Staff Adherence Rates



*p <.01; **p <.001

BMAT=Bedside Mobility Assessment Tool

purposeful rounding, BMAT completion) pre- and post-intervention are displayed in Figures 1 and 2. Overall adherence rate was computed and compared for each element using Fisher's exact test. Findings show statistically significant improvement in staff adherence for all four elements of fall prevention strategies (p<0.01). These findings suggest staff are more aware of current strategies and are documenting their efforts for fall prevention. Feedback provided during staff huddles reported inconsistent adherence to bed and chair alarm use with transitions in care, such as patients moving into and out of the room, or to other departments for tests or diagnostics; consistent communication across the care team for adherence to fall prevention policies is needed. Purposeful rounding has strong evidence as a strategy for fall prevention (Dykes et al., 2020; LeLaurin & Shorr, 2019; Morris et al., 2022). During this project, purposeful rounding identified inconsistent alarm use; team members reminded ancillary staff to reset and recheck the alarms during any patient transition.

Lessons Learned/Nursing Implications

Inpatient fall prevention is a complex process that requires involvement of all care team members, patients, and their families. This project demonstrated the benefit of empowering patients and staff members through education and re-education on fall prevention. No significant change was found in the fall rate during this project, but there was significant improvement in staff adherence to the hospital's fall prevention strategies. Also, the inclusion of weekly huddles during this project provided the opportunity for staff members to share challenges with unit leaders and the first author.

As a limitation of the project, patient education was not evaluated. Also, poor participation in the pre- and post-education survey may be due in part to distribution of information by email. Accessing email may be overwhelming for staff members who are trying to prioritize their time in providing patient care. Inclusion of other communication strategies (e.g., cell phones, text messages, PowerPoint linked through QR code for scanning during weekly huddles) may have encouraged more staff members to participate.

Conclusion

Falls occur even as fall rate is a key quality measure in acute care settings. Adherence to fall prevention policies significantly improved after implementation of a fall prevention education program for staff, patients, and their families. MSN

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The Role of Emotional Intelligence in Harnessing Effective Communication in Medical-Surgical Nursing

Lisa Bechok
Lyndsay Goss

Case Scenarios: The Crucial Role of Emotional Intelligence at the Bedside

Alice has felt overwhelmed by the demands of her job as a medical-surgical nurse. She snapped at a distressed patient, Mr. M., who had been pressing the call button repeatedly. Alice had failed to recognize the patient's increase in anxiety and pain. Instead, Mr. M. then felt more anxious and in pain. To make matters worse, other patients heard Alice's remarks and were fearful of communicating their needs.

Mark has a lot of challenges at home. His mother's illness is worsening, and yesterday Mark learned his mother would be placed in hospice. Mark came to work and found himself a bit distracted. Nurse manager Marie noticed Mark's distraction and questioned his performance and punctuality at the nurses' station where others could hear. This interaction left Mark feeling distraught and angry.

Emma, a new graduate nurse, is so excited to learn and finish her first full week as a registered nurse (RN). Emma seemed to be struggling a bit with time management and was moving slower than her preceptor Jared had expected. Jared found himself frustrated when Emma hesitated during an indwelling catheter insertion. Jared scolded Emma in front of the patient, "You should have learned this in nursing school. Why are you having so much trouble?" Emma left work after the shift feeling unsupported and doubting her future as a nurse.

Nursing is an emotionally, physically, and mentally taxing profession with daily challenges. Nurse burnout is on the rise, which can lead to fatigue (physical and mental) and cynicism (American Nurses Association, 2024). Reducing burnout is vital for nurses to continue to provide high quality care. High levels of burnout have been found in nurses due to emotional exhaustion (Kulakac & Uzun, 2023), highlighting the need for an increased understanding of emotional intelligence (EI).

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Bechok, L., & Goss, L. (2025). The role of emotional intelligence in harnessing effective communication in medical-surgical nursing. *MEDSURG Nursing, 34*(1), 44-46, 51. https://doi.org/10.62116/MSJ.2025.34.1.44

Emotional intelligence (EI) is an important skill for all nurses, helping them process work stressors and empathize with patients and colleagues, and fostering meaningful relationships and effective collaboration to optimize patient care outcomes. Nurse leaders can make a difference by encouraging and mentoring EI in their everyday work with staff and patients.

Keywords: emotional intelligence, reasoning, cognition, self-awareness, self-management, empathy, communication

EI is an important skill for all nurses: the experienced clinical nurse, new graduate nurse, or nurse leader. Empathy, a component of EI, has been shown to have a positive impact, suggesting nurse managers need to be aware of symptoms of burnout but also strategies to address this concern (Topcu et al., 2023). What EI strategies could have helped nurses in these case scenarios better prepare to use EI in their responses?

Introduction to EI

EI is "a type of intelligence that involves the ability to process emotional information and use it in reasoning and other cognitive activities" (American Psychological Association, 2018). The term *emotional intelligence* was coined by psychologists Peter Salovey and John Mayer, and made popular by Daniel Goleman (Goleman & Cherness, 2023). EI comprises five key elements: self-awareness, self-management, motivation, empathy, and managing relationships. EI is essential for nurses because it enhances their proficiency to navigate interactions through self-awareness and self-management, ensuring nurses maintain composure and focus during challenging situations. Moreover, EI enables nurses to empathize with patients and colleagues, fostering meaningful relationships and effective collaboration to optimize patient care outcomes.

Fostering EI in Clinical Nurses

Nurses' health and well-being represent one priority described in *The Future of Nursing* report; not addressing them can lead to burnout, compassion fatigue, and poor health (National Academies of Sciences, Engineering, and Medicine, 2021). The largest decrease in the number of nurses in decades was seen in 2020-2021, with more than 100,000 leaving the profession; many of these nurses were under age 35 (Auerbach et al., 2022). One way to address these challenges is through EI, which has been associated with positive outcomes in retention of staff and job satisfaction (Rhodes & Foran, 2022).

EI in clinical nurses must be fostered to improve workplace relationships, patient care, and personal wellness. It promotes a higher quality of professional life and has positive mental health effects on nurses, ultimately improving caring behaviors such as empathy (Alinejad-Naeini et al., 2024). EI also has been shown to enhance communication (Alinejad-Naeini et al., 2024; Raeissi et al., 2019), allowing nurses to provide better care for patients and collaborate as part of an interprofessional team.

Strategies for nurse managers and other leaders to use in fostering EI among clinical nurses include investing in their employees and encouraging employees to practice self-care methods. Committing to professional development and training programs related to EI can promote more effective communication and compassionate care. Nurse managers and leaders can train clinical nurses on the value of mindfulness and related strategies. Mindfulness training has been shown to increase EI, improve communication, and enhance human caring (Kou et al., 2022).

Fostering EI in New Graduates

The most pressing and important reason for fostering EI in new graduates is related to the current nursing shortage. According to the World Health Organization, a shortage of 7.2 million nurses is expected worldwide and demand will increase to 12.9 million nurses by 2035 (as cited by Tamata & Mohammadnezhad, 2023). Nurses are essential for mentoring future generations of nurses (Skillman & Toms, 2022).

Despite organizational efforts to keep new nurses, many of them leave the profession within the first 5 years of practice (Terry et al., 2024). One of the main reasons for this exodus is dissatisfaction with their work. This dissatisfaction with work environments often leads to burnout, affecting the nursing labor pool in an alarming way (Skillman & Toms, 2022).

EI provides skills and competencies that enable nurses to relate to others, adapt to their immediate surroundings, and cope with environmental stressors (Mazzella-Ebstein et al., 2021). EI helps nurses better tolerate job strain and compassion fatigue, ultimately allowing better quality of care, stronger communication, and overall increased satisfaction in their work (Maillet & Read, 2021). Nurses with good EI skills are better able to make more empathic clinical decisions that positively influence patient care (Mazzella-Ebstein et al., 2021).

Preceptors can make intelligence a part of daily practice for new nurses, which will help new graduates further develop their EI. It is important to give new graduates opportunities to process emotion and debrief challenging situations, providing time during the shift to decompress and be mentored. Preceptors should take advantage of less busy times to check on new graduates and give them an opportunity to discuss any challenges they are having. This encourages vulnerability, an important part of EI (Mazzella-Ebstein et al., 2021).

Preceptors should make development of emotional skills a priority for new graduates. Practicing self-awareness, self-regulation, and empathy are key to EI. For example, preceptors could ask new graduates to put themselves into patients' shoes and describe what they think patients are feeling as well (Mazzella-Ebstein et al., 2021). Preceptors should encourage new graduates to join a support network, such as a new graduate program, to give them a safe place to build genuine relationships and talk about the emotional challenges of being a nurse (Maillet & Read, 2021). Active and attentive listening should be encouraged in patient interactions, with the preceptor alert to nonverbal cues. Independence in their nursing practice and judgment should be supported. When nurses have autonomy and freedom to work independently, they develop intrinsic motivation for learning that drives them to continue to learn and grow (Maillet & Read, 2021).

Fostering EI in Nurse Leaders

Nurse leaders are expected to provide efficient, individualized quality care while managing issues affecting the nursing industry locally and globally (Butler, 2021). They must manage budgets and clinical practice concerns while also managing staff. Thus, nurse leaders constantly shift from analysis and critical thinking to the more abstract and far less linear emotional aspects of practice and people. Emotionally intelligent nurse managers can inspire others and encourage intrinsic motivation to help others achieve goals that otherwise might not have been reached (Suwaidi, 2021).

Nurse managers' EI has been correlated positively with decreased staff turnover and increased staff resilience (Suwaidi, 2022). Nursing professionals with increased EI experience less emotional exhaustion, fewer psychosomatic complaints, more satisfaction with their work, greater collaboration with peers, fewer unidentified patient care needs, and better emotional health (Alsufyani et al., 2020). To continue to cultivate their EI skills, nurse leaders should focus on communication skills as an important component of EI. When nurse managers effectively communicate, nursing staff feel safe and valued. Advanced social skills help leaders communicate effectively with colleagues in a variety of roles and can help build professional relationships (Butler, 2021).

Providing educational opportunities such as an EI course allows nurses to learn and practice EI skills and receive formative feedback. Courses that provide continued professional development of critical thinking and EI allow the cultivation of EI. A formal peer mentoring program also can help promote well-being and increase self-awareness of emotions and actions (Butler, 2021).

Empathy, self-regulation, and self-awareness are key qualities of nurse leaders. When nurse leaders show empathy, they can see and interpret others' body language and are willing to learn from others through listening actively and asking questions (Butler, 2021). Showing empathy to nursing staff can help nurse leaders build trust with the staff. Butler (2021) found several qualities of self-regulation as key in leaders: passionate, thoughtful, motivated in seeking to make improvements, embracing change, and being in control of their emotions.

Revisiting the Case Scenarios with EI at the Bedside

Alice had felt overwhelmed by the demands of her job as a medical-surgical nurse. She recently attended a professional development session on deep breathing and mindfulness. She found herself feeling frustrated with Mr. M continuously pressing the call button, so she paused to take three deep breaths before entering the room to address his needs. Alice realized Mr. M was having increased pain, which was causing anxiety. She called the provider to report this finding and get an updated medication order. By the end of shift, Mr. M's pain and anxiety were decreased.

Facing many challenges at home, Mark learned last night his mother would be placed in hospice. Mark came to work and found himself distracted. Nurse manager Marie noticed Mark's distraction and pulled him aside privately. Marie acknowledged Mark's recent change in performance and asked if everything was okay. Mark shared what was happening in his personal life. They worked together to develop a plan to decrease his workload over the next several weeks so he could spend more time with family and address his mother's medical needs.

Emma, a new graduate nurse, was so excited to learn and finish her first full week as an RN. Emma seemed to be struggling with time management and was moving slower than her preceptor Jared had expected. Jared found himself frustrated when Emma hesitated during an indwelling catheter insertion. Jared paused to remember how he felt as a new nurse. Jared patiently waited for Emma to finish the procedure. Jared and Emma then debriefed on this procedure. Emma left feeling proud of what she had accomplished during the first week as an RN.

Conclusion

EI helps nurses process the stressors of their work, rise above challenges, and even excel in the current fragmented healthcare system (Mazzella-Ebstein et al., 2021). Nurse leaders can make a difference by encouraging and mentoring EI in their everyday work with staff and patients (Butler, 2021). New nurses, experienced nurses, and nurse leaders can develop their EI to enhance their ability to help themselves and their patients. MSN

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Impact of Cultural Competence on Patient Education

Sonya Blevins

The population of the United States is more culturally diverse than ever. Regardless of the clinical practice setting, nurses encounter a variety of cultures while caring for patients and their families. In an effort to provide patient-centered care, patients' cultural, social, and linguistic needs have to be met (Deering, 2024). A decade ago, the American Hospital Association recognized the importance of culture and how healthcare professionals should strive to assess the impact of culture on patient care while expanding cultural knowledge to adapt healthcare services to meet patient needs (Health Research & Educational Trust, 2013). For members of the nursing profession, the *Code of Ethics* acknowledges the impact of culturally competent care (American Nurses Association, 2015). Provision 1 states, "The nurse practices with compassion and respect for the inherent dignity, worth, and unique attributes of every person" (p. 1).

Based on acknowledgement of the importance of cultural diversity, the term *cultural competence* has come to the forefront of health care and nursing. Aydogdu (2022) referred to cultural competence as an individual's attitudes and beliefs that facilitate the appropriate, effective response in culturally diverse situations. Having a level of cultural competence helps nurses identify social determinants of health (SDOH) that impact quality care and communication. By understanding SDOH, nurses can reduce barriers while improving communication. To care effectively for patients, nurses must approach their role with a heightened respect for and understanding of cultural beliefs, and social and linguistic needs.

Importance of Cultural Competence in Patient Education

The purpose of patient education is to equip patients with the necessary information to understand their medical conditions. When education is not applied effectively, the financial burden increases for patients, communities, and healthcare organizations. Gusman (2022) noted every $1 spent on patient education can save $3-$4 in healthcare costs when performed effectively. In the United States alone, ineffective patient education on healthcare conditions contributes to $69-$100 million paid by the healthcare system.

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Cultural awareness is a component of effective patient education. Recognizing the uniqueness of patients' cultural beliefs assists nurses in providing education tailored to their specific needs and furnishes patients with needed information to be proactive in their healthcare plan.

Keywords: cultural competence, cultural awareness, patient-centered care, patient education

While patient education has enormous impacts on finances, it also impacts patients' pathway to better health. Health outcomes are improved as patients are provided with personalized plans of care tailored to their needs. Patients have a voice in their care while being able to express their thoughts in a culturally appropriate manner. A level of trust is developed between patients and providers, facilitating improved communication to address treatment plans, barriers to care, questions, and concerns. The ability of patients to express their needs improves healthcare access and equity. Patients have increased satisfaction when their needs are being met within the healthcare system (Nevada State University, 2024). With this increased satisfaction, patient adherence and self-care are improved (Gusman, 2022).

Components of Culturally Competence in Patient Education

To provide education effectively, nurses must acknowledge patients' cultural beliefs while recognizing how these beliefs differ from their own. This process is done through having cultural awareness, attitude, knowledge acquisition, and application.

Cultural Awareness

When engaging with patients, nurses should view their relationship through an unbiased approach to care (Gamboa, 2024). As a result, nurses must be aware of how they react to cultures different from their own and then address any potential bias so it does not conflict with the nurse-patient relationship. Having self-awareness of personal culture and its influences is necessary to prevent the adverse impact of bias with patient interactions (Deering, 2024).

Attitude

Once cultural awareness is acknowledged by nurses, an analysis of the cultural differences with patients occurs. Understanding these differences provides an opportunity for nurses to adapt communication strategies to engage better with patients. By doing this, nurses can identify ways to address differences while promoting a better connection with patients and their families (Deering, 2024).

Knowledge Acquisition

Nurses constantly learn new information in their professional roles. It is no different when it comes to seeking knowledge about various cultures. From a community perspective, it is important for nurses to seek an understanding of cultural practices in the various patient populations under their care. Having a broader understanding will improve nurses' approach as they provide patient care (Gamboa, 2024). In patient situations where nurses do not know or understand specific cultural practices, they simply should ask the patients. Most patients are willing to share their practices. This engagement demonstrates nurses' willingness to learn while showing a level of respect in providing care.

Skills Application

Nurses must put their cultural awareness, attitudes, and knowledge into practice. Repetition of culturally appropriate behaviors helps to engrain these behaviors into everyday practice. These skills are applied with verbal and nonverbal communication, use of personal space, and awareness of family hierarchy. With each culture, a person's actions can mean different things (Deering, 2024).

Verbal and Non-Verbal Communication

For education to be effective, communication should be clear among patients, family members, and nurses. When communicating, nurses should recognize the impact of dialects, voice tone, and volume (Gamboa, 2024). If a patient is a non-English speaker, nurses should use a medical interpreter to facilitate information exchange in the patient's primary language. Using relatable terms familiar to the lay person helps simplify the explanation of a complex condition. Nurses should ask follow-up questions to ensure the patient understands the information. This process helps to identify areas in which additional clarification may be needed.

Non-verbal communication is just as important as verbal communication when engaging with patients. For example, while certain gestures may be appropriate in American culture, they can be offensive in other cultures (Deering, 2024). Nurses also should engage with patients when they are speaking, actively listening without interruption to what they say and how they are speaking. Patients need time to ask their questions without being interrupted (Gamboa, 2024).

Personal Space

Personal space, which refers to acceptable norms regarding personal touch, personal space, and distance from other individuals, differs by culture. Norms also may differ depending on a person's gender (Gamboa, 2024).

Family Hierarchy

Hierarchies may vary regarding identification of the leader of the family group. In some cultures, the father is viewed as the lead figure; in others, the mother may be the head of the family. Depending on the culture, nonfamily members also may be considered part of the family group (Gamboa, 2024).

Patient Education in Practice

When providing patient education to culturally diverse groups, nurses first should complete a needs assessment. The needs assessment identifies areas in which the patient requires further guidance and education. Needs assessments are completed through community surveys, qualitative interviews, and other data sources. The assessment facilitates development of a culturally appropriate patient-centered education plan (Gusman, 2022).

Nurses also should understand the impact of health literacy for different patient groups. Older adults, minority groups, and persons with a lower education level often have lower health literacy. This contributes to a lack of knowledge and understanding of their health condition (Gamboa, 2024). When educating patients, nurses should keep the information simple and use plain language. Once health literacy is determined, nurses should identify how the patient learns best (visual, aural, reading/writing, kinesthetic). Patients may use one or multiple methods to learn, and education should be tailored to that preference. No two patients may learn the same way. With the growth of digital education, nurses also can explore use of additional formats. Digital education offers text, visual, audio, interactive, and animated formats in various languages (Gusman, 2022).

Conclusion

The most direct way to improve patient-centered care is through use of culturally competent care. Having cultural awareness is needed not only for direct clinical care but also for patient education. Recognizing the uniqueness of patients' cultural beliefs assists nurses in providing education tailored to their specific needs and furnishes patients with needed information to be proactive in their healthcare plan (Nevada State University, 2024). MSN

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Nursing Assessment to Prevent Venous Thromboembolism

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Bartzak, P.J. (2025). Nursing assessment to prevent venous thromboembolism. *MEDSURG Nursing, 34*(1), 49-51. https://doi.org/10.62116/MSJ.2025.34.1.49

Medical-surgical nurses care for patients who are at risk for venous thromboembolism (VTE). Through increased knowledge, assessment skills, team communication, and patient education, nurses play a key role in preventing VTE and improving patient outcomes.

Keywords: venous thromboembolism, pulmonary embolus, deep vein thrombosis, blood clot, risk assessment

Medical-surgical nurses care for patients who are at risk for venous thromboembolism (VTE) and who also may develop a pulmonary embolus (PE). VTE is defined as a blood clot that forms in a vein typically in the lower extremities; it also can occur in the thigh or pelvis. Patients with upper extremity intravenous lines, such as a peripherally inserted central catheter, can develop a blood clot in their upper arms (Centers for Disease Control and Prevention [CDC], 2024). The more serious PE occurs when the clot travels to the lungs, typically blocking a branch of the pulmonary artery.

Acute signs of a deep vein thrombosis (DVT) can include a swollen and painful leg that may have associated warmth and discoloration compared to the other leg (CDC, 2024). Typically, DVT and PE occur on a spectrum where the blood clot develops in an extremity and then travels to pulmonary vasculature. However, Palareti and colleagues (2019) described the occurrence of an isolated PE, referred to as I-PE. Their research suggested approximately 80% of pulmonary emboli occur as part of the DVT/PE continuum, whereas nearly 20% occur in isolation. Groups at risk for I-PE included older females, younger females taking contraceptives, and patients with heart failure or cancer. Shen and colleagues (2020) suggested 50% of VTE are related to immobilization, trauma, surgery, or hospitalization within the past 90 days; 20% are due to cancer diagnoses, and 30% are unprovoked occurrences.

Signs and symptoms of PE include chest pain, difficulty breathing, tachycardia, new arrhythmia, hemoptysis, hypotension, and lightheadedness (CDC, 2024). Patients may have a subtle presentation that unfortunately may result in late delivery of life-saving interventions, increasing the likelihood of disability and death (Shen et al., 2020). Nursing assessment tools are available to identify and score risk factors for DVT. Recently, these tools have been enhanced with artificial intelligence technology to improve early identification, and lead to earlier interventions.

Risk factors for DVT and non-isolated PE include older age, history of VTE, cancer and chemotherapeutic medications, heart failure, abnormal baseline pulmonary function, sepsis, infection, inflammatory bowel disease, systemic lupus erythematosus, orthopedic and neurosurgical procedures, reduced calf pump function, and surgery lasting more than 45 minutes (Bahl et al., 2024; Henke et al., 2020; Houghton et al., 2021; Liu et al., 2024). Physical therapists may be more attuned to calf pump function than medical-surgical nurses. However, nurses should keep this risk factor in mind as the strength of the calf muscle supports venous return from the legs to the heart. The inability of calf muscles to pump blood to the heart causes lower extremity venous stasis and clot formation (Houghton et al., 2021). Currently available VTE risk assessment tools do not account for calf muscle function.

VTE Assessment

Several VTE assessments are commonly embedded into electronic health records (EHRs). The two most frequently used are the Caprini and Padua risk assessment models (Hayssen et al., 2024). The Caprini model has more than 30 assessment questions; the Padua model contains 11 assessment questions. Some practice environments do not include any VTE assessment scale; rather clinical assessment and judgment are used as more formalized tools may be considered a barrier to clinical autonomy (Zha et al., 2022). Zha and colleagues surveyed nurses using the Unified Theory of Acceptance and Use of Technology (UTAUT), concluding the main impetus for nurses to use VTE assessment tools was a top-down performance expectation by their employers. Nurses already complete fall and skin assessments among other point-and-click EHR documentation. A

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VTE scale, while critically important to assess DVT and PE risk, is viewed as another documentation task. Alerts in the order entry systems are necessary to ensure VTE is also on providers' minds.

Identifying patients at risk for DVT or PE is critical as DVT and progression to PE constitutes the third most fatal cardiovascular event. Ongoing complications can include post-thrombotic syndrome and pulmonary hypertension (Zha et al., 2022). DVT is considered a preventable event (Henke et al., 2020; Zha et al., 2022). Henke and colleagues (2020) cited American Heart Association (AHA) recommendations to establish a benchmark for preventable VTE and develop a centralized tracking database not only to capture in-hospital VTE but also to track 30-day post discharge occurrences. Findings of a study by Bahl and colleagues (2024) suggested post-discharge VTEs accounted for 75% of all VTEs. The AHA also identified a need to increase public awareness of VTE so patients can self-advocate (Henke et al., 2020). Patient awareness of VTE is approximately 30% lower than knowledge of myocardial infarction, stroke, and HIV.

Caprini and Padua Risk Assessment Models

Parameters in the Caprini risk assessment model include age, length of surgery, major surgery greater than 45 minutes within the last month, visible varicose veins, history of inflammatory bowel disease, swollen legs, body mass index (BMI) greater than 25, heart attack, congestive heart failure, serious infection, lung disease, bed rest/restricted mobility, smoking within the last month, diabetes requiring insulin, chemotherapy, blood transfusion, use of oral contraceptives or hormone replacement therapy, pregnancy or delivery within the last month, cancer/past malignancies, nonremovable plaster cast or mold, central venous catheter, history of blood clots, family history of blood clots, hip/knee/leg surgery, broken pelvis/hip/leg, serious trauma, spinal cord injury, and stroke (Cronin et al., 2019). The Padua risk assessment model includes the following 11 parameters: active cancer, previous VTE, reduced mobility, known thrombophilic condition, trauma or surgery within last month, age greater than 70, heart/respiratory failure, myocardial infarction/ischemic stroke, infection/rheumatological disorder, BMI greater than 30, and ongoing hormone treatment (Barbar & Prandoni, 2023).

The Caprini risk assessment model is considered more comprehensive; some research has shown the Padua model to be significantly less correlated to VTE (Chamoun et al., 2019). According to Henke and colleagues (2020), the Caprini model demonstrates less variation in predicting VTE risk in patients undergoing surgery. The Padua risk assessment model is less predictive of VTE than the Caprini model, especially in patients undergoing chemotherapy (Lukaszuk et al., 2018). The Caprini model is already being used as the base for overlaid machine learning algorithms to improve VTE risk prediction (Sheng et al., 2023). However, a 6-year nationwide Veterans Affairs study compared specificity and sensitivity of the models and found both had low predictive VTE ability; authors called for development of more robust VTE assessment tools (Hayssen et al., 2024). Beyond use of VTE assessment tools, Henke and colleagues (2020) argued there should be a lower threshold for imaging techniques such as duplex ultrasonography, and in some cases use of computed tomography angiography.

VTE Treatment

Basic preventive measures include ambulating the patient when not contraindicated, avoiding dehydration, and applying foot pumps or sequential compression devices as ordered. Providers also may order anticoagulants: vitamin K antagonist (warfarin), low molecular weight heparin (enoxaparin), or novel oral anticoagulant (apixaban) (Lukaszuk et al., 2018; Yi et al., 2022). While anticoagulants can prevent VTE, they also increase risk of bleeding that can range from manageable to life-threatening. The conundrum between clot prevention and bleeding risk has led to underuse and overuse of chemical thromboprophylaxis.

Henke and colleagues (2020) reported one missed dose of ordered chemical prophylaxis increases the risk of DVT five-fold. Patients sometimes refuse subcutaneous injections due to perceived or real discomfort, or they rationalize their ambulatory accomplishments. However, Henke and co-authors reported more than half of symptomatic VTE occurred despite optimal audited pharmacological prophylaxis. Nurses have a duty to educate patients about risks of missed doses, and also raise concerns to providers about potential increased risk of bleeding.

Implications for Nurses

Medical-surgical nurses must be aware of the patient's medical, surgical, and family history to understand fully the risk for VTE/PE. Nurses also must collaborate with providers concerning the patient's anticoagulant use, with knowledge about when to hold, restart, and possibly replace medications in the hospital setting and at discharge. Nurses must be vigilant about checking laboratory values such as the complete blood count and coagulation profile, in addition to routine values. Abnormal values must be reported timely to the provider and documented in the EHR.

Medical-surgical nurses are responsible for timely completion of patient assessments, including VTE assessments, even when the number of questions is lengthy. The scoring guides for the Caprini and Padua risk assessment models include prompts for nurses to take action. Nurses must apply mechanical methods consistently as ordered to prevent VTE. Nursing judgment and critical thinking are essential; assessments involving signs and symptoms of VTE/PE, as well as bleeding risk, must be communicated immediately to

the provider. As always, nurses must be patient advocates to ensure concerns are addressed.

Finally, medical-surgical nurses must educate patients about basic VTE prophylaxis and encourage and assist patients to ambulate and remain hydrated. This education also must address administration of chemical prophylaxis, so patients are aware that interrupted treatment increases the risk of VTE. With nurse knowledge, vigilance, assessment skills, and team communication, VTE can be prevented and patient outcomes improved. MSN

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