TRANSFORMING NURSING THROUGH KNOWLEDGE

Best Practices for Guideline Development, Implementation Science, and Evaluation

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RNAO
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L'Association des infirmières et infirmiers autorisés de l'Ontario

CHAPTER

5

TECHNOLOGY AS AN ENABLER OF EVIDENCE-BASED PRACTICE

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LEARNING OBJECTIVES

After reading this chapter, you will be able to:

- Understand the importance of technology as an enabler of evidence-based practice
- Outline RNAO's technology-related resources that support evidence-based practice
- Describe nursing order sets and their benefits
- Determine strategies to integrate the nursing order sets as clinical decision supports in evidence-based practice
- Define the concept of International Classification for Nursing Practice (ICNP) as a standardized nursing language and explain its benefits
- Delineate key recommendations from RNAO's eHealth-related BPG, *Adopting eHealth Solutions: Implementation Strategies*

INTRODUCTION

The paradigm shift in healthcare in recent years has resulted in a new focus on the use of technology to increase efficiency, enhance patient safety, and optimize health outcomes. With this paradigm shift came a solution to the dilemma of the widely reported 17-year lag between the production of research evidence and its integration into practice (Kumar, 2012). This recognition of technology as an enabler of evidence-based practice was the catalyst for RNAO to develop implementation resources to more effectively facilitate ease of access to its Best Practice Guidelines (BPG) at the point of care.

This chapter describes RNAO's advancement into the world of technology where its current focus is the development of innovative eHealth resources to promote evidence-based practice. Key resources discussed in this chapter include: 1) an app that enables clinicians to access the RNAO guidelines on mobile devices such as smartphones and tablet computers; 2) nursing order sets that simplify the process of integrating BPGs into electronic health information systems; and 3) a BPG to enhance the involvement of healthcare leaders, nurses, and other clinicians in all phases of an eHealth implementation.

EHEALTH

eHealth is defined by the World Health Organization (WHO) as "the use of information and communication technologies (ICT) for health" (WHO & International Telecommunication Union [ITU], 2012, p. 1). Its primary goal is to enhance the flow of information, using technological means, to more effectively support healthcare delivery and the management of health systems (WHO & ITU, 2012). eHealth supports a variety of needs in the health sector.

In hospitals, eHealth encompasses (but is not limited to) the use of information and communications technologies to support administrative systems, patient care services (e.g., telemedicine, diagnostic services, medication management, healthcare delivery), and consumer health services (e.g., patient portals) (Health Canada, 2010). In the home care and public health sectors, eHealth facilitates remote patient monitoring and clinicians' access to information through the use of mobile technology (e.g., smartphones and tablet computers) (Health Canada, 2010). Further, in the long-term care sector, eHealth is evident in the use of computer systems by nurses and other care providers for electronic documentation, order entry, and electronic prescribing (Health Canada, 2010).

Since the introduction of eHealth as a national and provincial strategy to revolutionize and modernize healthcare delivery, RNAO has been actively advocating for nurses to be fully engaged throughout the process. The added value of registered nurses and nurse practitioners at the decision-making tables ensures their perspectives are adequately reflected in the eHealth infrastructure. Moreover, their contributions during the planning stages positively influence the design of electronic health information systems that are user-friendly and clinically relevant for nurses and other clinicians (RNAO, 2017a).

Beginning in 2005, RNAO has kept pace with the trends in hospitals and other health organizations to leverage technology to support care delivery. In that year, RNAO launched its nursing and eHealth program (with funding from the Ontario Ministry of Health and Long-Term Care) to empower nurses to adopt and effectively utilize eHealth innovations and evidence-based eResources (RNAO, 2006, 2009, 2013b). Over several years of working in partnership with the Ontario Government, RNAO developed evidence-based eLearning and educational resources to inform nurses and other clinicians about eHealth

and its benefits and applicability to nursing and the entire healthcare sector. RNAO also built a cadre of approximately 1,500 eHealth Champions to lead and support the adoption of eHealth amongst nurses and other clinicians.

In 2009, following the outstanding successes of the eHealth Champions, RNAO was funded to head the Nurse Peer Leader Project through Canada Health Infoway's (Infoway) Clinician Support Network Program. Infoway is Canada's national body that aims to optimize the use of eHealth to increase value for individuals and the health system.

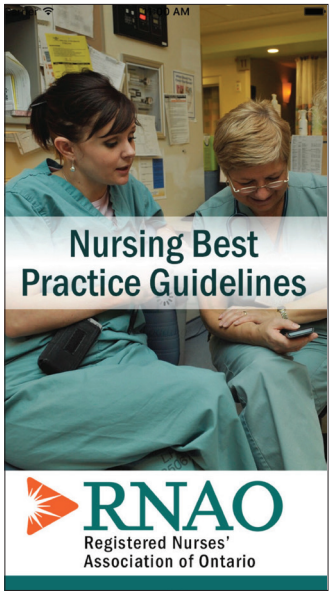
Within its broad mandate, Infoway extends tremendous effort to increase clinician engagement in eHealth through regional clinician support network projects that target nurses, pharmacists, and physicians across the country. The RNAO Nurse Peer Leader Project resulted in a network of 14 nurses throughout the province of Ontario, Canada, who worked within all sectors (including academia), to raise awareness of eHealth and its value in nursing. In addition to this "unfreezing" role, peer leaders also provided nursing input to eHealth decision-making locally and regionally, often role modeling effective use of eHealth in nursing. These peer leaders were part of a network that was supported through education and professional development in eHealth and change management, and they spread an active virtual community of practice and interactive coaching. Their roles paved the way for greater involvement of nursing in eHealth decision-making and led to a further successful Infoway-funded Ontario Peer Leader Project with RNAO in partnership with the Ontario Medical Association. This initiative, which extended from 2012 to 2014, focused on advancing the adoption of eHealth in primary care.

The eHealth champions and peer leaders were both creating and noting the trend for a greater readiness amongst nurses to adopt eHealth in day-to-day practice activities. This trend was a catalyst for the launch of RNAO's first eHealth innovation in 2011—the *RNAO Nursing Best Practice Guidelines* app, designed for use on mobile devices such as smartphones and tablet computers (Wilson, Bajnok, & Costa, 2015).

RNAO NURSING BEST PRACTICE GUIDELINES APP

The *RNAO Nursing Best Practice Guidelines* app (see Figure 5.1) was developed to facilitate access to condensed versions of over 50 clinical and healthy work environment guidelines at the point of care (Bajnok, Burkoski, & Doran, 2012; Doran et al., 2010, 2012; RNAO, 2016a). With this new electronic resource, nurses have access to the practice recommendations, related evidence, and teaching tools at their fingertips. The app has quickly become a popular resource used by nurses and other clinicians around the world (RNAO, 2016a). For many nurses, it became a critical professional practice aid to prepare for patient care, answer questions during care delivery, conduct health teaching with patients, access clinical resources, and serve as a reference to support practice decisions (Doran et al., 2010, 2012).

Just prior to the 5-year anniversary of its launch, in an effort to refine and expand the app's utility, RNAO conducted a survey of end users in 2015. The survey results prompted an upgrade of the app to provide an even more user-friendly resource with advanced functionality aimed at enhancing the practice of nurses and other clinicians, globally.



"Glad to have the BPGs in a portable, fast, well-organized format. A great tool to utilize to ensure delivery of quality care!"

"Thank you—this is incredible! For nurses working in home care and other areas where computers and Internet aren't available, this is the perfect resource for the most up-to-date evidence-based practices."

"Amazing!! Quick evidence-based information at your finger tips! A must for students and nurses in any setting."

FIGURE 5.1 *RNAO Nursing Best Practice Guidelines* app with quotes from users.
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The upgraded app incorporates the following design features and functionality:

- Concise, clinically relevant, evidence-based guidelines to assist with the assessment, decision-making, and management of patients with a variety of health conditions (e.g., stroke, ostomy, pain, and pressure injury)
- Guidelines categorized by subject/topic (i.e., chronic disease management, addiction and mental health, care of older persons, etc.) with the option to display the guidelines in alphabetical order
- Enhanced search functionality for quick reference

REFLECTION

How does or could access to the RNAO BPG app impact your nursing practice?

The app's usability was an important consideration during the redesign. The International Organization for Standardization (ISO) defines usability as the "extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO 9241-11, 2016, para. 2). Multiple usability sessions involving nurses and other health professionals were conducted prior to the release of the revised app. The usability of the the final product was ranked very high by the end users. A contributing factor to the app's usability is the inclusion of consistent headings to organize the content of the condensed clinical and healthy work environment guidelines (shown in Figure 5.2).

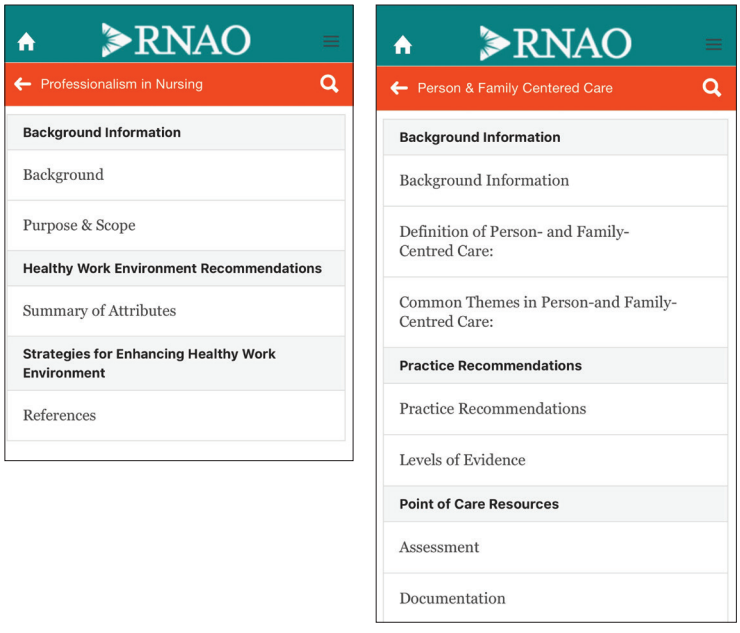

FIGURE 5.2 *RNAO Nursing Best Practice Guidelines* app—Standardized headings used for clinical and healthy work environment guidelines.
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The app is available for free download for Apple and Android mobile devices from the App Store and Google Play Store, respectively. Since its relaunch in 2015, the app has been downloaded by hundreds of users in over 70 countries across the globe, affirming the value of the app in assisting clinicians with point-of-care decision-making and in promoting evidence-based practice. Through such tools as the app, clinicians' point-of-care access to evidence-based resources translates into appropriate and timely healthcare interventions for their patients, leading to optimal health outcomes.

Mobile devices represent one of two groundbreaking ways that RNAO is leveraging technology to enable evidence-based practice; the other is nursing order sets.

NURSING ORDER SETS

As originally designed, beginning in 1999, the RNAO BPGs were intended to be used in environments with paper-based communications tools, health records, and clinical resources. With the increasing use of electronic health information systems, RNAO devised a novel implementation strategy to seamlessly integrate the BPGs within these systems. In 2011, RNAO began developing, disseminating, and actively supporting the adoption and evaluation of nursing order sets.

The term *order set* is used to describe a list of orders or interventions that are recommended for specific patient diagnoses, conditions, and treatment (Idemoto, Williams, & Blackmore, 2016; Slavik Cowen & Moorhead, 2014). An order set may support clinical decision-making at the point of care as a paper-based resource or as a resource embedded within an electronic health information system (Wilson et al., 2015).

Order sets were originally associated with physician orders, but more recently, the term has been increasingly used in reference to interventions that fall within the domain of nursing (Canadian Association of Schools of Nursing, 2012; RNAO, 2012). A case in point is the study by Drake and colleagues (Drake, Redfern, Sherburne, Nugent, & Simpson, 2012), which referred to a standardized pressure ulcer nursing order set that existed in the hospital where they conducted their research. The order set was introduced to help nurses conduct pressure ulcer risk assessments and implement preventive measures for at-risk patients. Similarly, Kruse and Rigotti (2014) examined the effectiveness of adding a screening question for second-hand smoke exposure to an existing nursing admission order set.

RNAO's nursing order sets complement the specific clinical Best Practice Guideline from which they are derived by distilling the practice recommendations into evidence-based, actionable intervention statements that can be used to formulate a person's plan of care (Wilson, 2013). Table 5.1 shows two practice recommendations from the RNAO (2013a) guideline *Assessment and Management of Foot Ulcers for People with Diabetes*, Second Edition, and the corresponding action-oriented interventions in the nursing order set.

TABLE 5.1 BPG PRACTICE RECOMMENDATIONS AND CORRESPONDING ACTION-ORIENTED INTERVENTIONS IN NURSING ORDER SET

PRACTICE RECOMMENDATIONS ASSESSMENT AND MANAGEMENT OF FOOT ULCERS GUIDELINE	ACTION-ORIENTED INTERVENTIONS ASSESSMENT AND MANAGEMENT OF FOOT ULCERS NURSING ORDER SET
1.1 Identify the location and classification of foot ulcer(s) and measure length, width, and depth of wound bed.	❑ Assess foot ulcer(s) using a validated tool on admission or initial contact ■ Identify the location and classification of the foot ulcer(s). ■ Measure the length, width, and depth of the wound bed using a consistent tool.
4.0 Monitor the progress of wound healing on an ongoing basis using a consistent tool, and evaluate the percentage of wound closure at 4 weeks.	❑ Observe and measure pressure ulcers on an ongoing basis using the PUSH Tool ■ Evaluate the percentage of wound healing at 4 weeks. ■ If a 50% reduction in surface area is not achieved in 4 weeks, a comprehensive reassessment of the client and treatment plan should be conducted before advanced healing technologies are considered.

As can be seen, the nursing order sets are tools to translate evidence into practice and reduce variation in care by outlining the specific interventions required and when and how they should be carried out. Furthermore, the integration of these order sets into electronic health information systems increases clinicians' access to evidence-based interventions to inform their practice, whenever and wherever they need them (Wilson, 2013).

An added feature of RNAO's nursing order sets is their flexibility. They can be readily incorporated into any electronic health information system or clinical context (e.g., acute care, primary care, long-term care, home care, or community care) (Wilson, 2013). This flexibility was a significant consideration during the development process.

DEVELOPMENT PROCESS

In their evidence-based analysis, Healthcare Human Factors (HHF) (2009) noted variability in the order set development process related to the type of methodology and the type of developers used. In some instances, the methodology was consensus of opinion. In others, the order set development process was informed by evidence. The HHF report also identified two types of order set developers: in-house clinicians, and working groups composed of clinicians from different organizations. In the latter case, the order sets are often made available to other healthcare organizations either as part of a library or embedded in a computerized provider order entry system.

RNAO uses a hybrid methodology when developing its order sets, beginning with a detailed analysis of the evidence-based practice recommendations and the corresponding evidence published in the Best Practice Guideline (see Figure 5.3). This step ensures that pertinent nursing intervention statements and clinical decision support resources are included in the nursing order set.

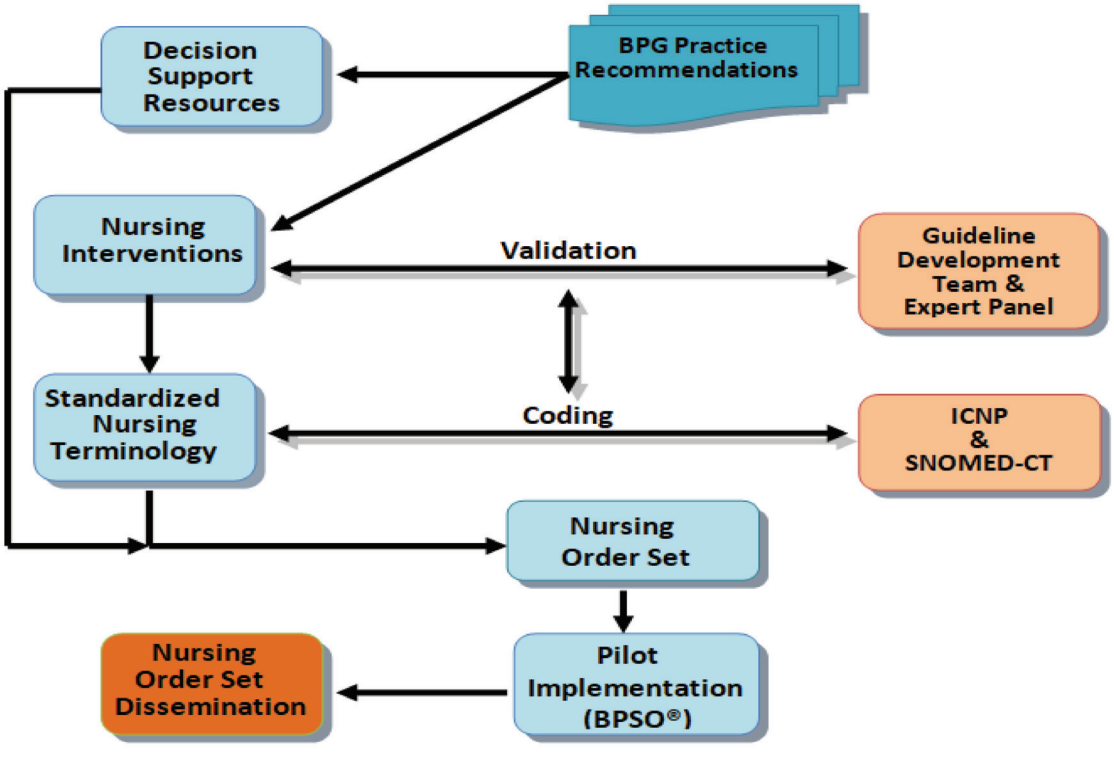

FIGURE 5.3 Nursing order set development process.
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Individual nursing intervention statements are drafted in accordance with two international nursing-specific standards: 1) Health informatics: Categorical structures for representation of nursing diagnoses and nursing actions in terminological systems (ISO 18104:2014) (ISO, 2014); and 2) International Classification for Nursing Practice (ICNP) 7-Axis Model (International Council of Nurses [ICN], 2009). The ICN developed ICNP as the international standardized terminology language to describe the work that nurses do (Coenen & Kim, 2010).

Upon completion, the draft intervention statements are validated using a collaborative approach involving RNAO's guideline development team of registered nurses and members of the expert panels who developed the BPG. Once validated, a working group composed of a nursing informatician from the RNAO and expert terminologists from the ICN map the interventions to ICNP. *Mapping* is the process by which similar or related concepts or terms are formally interrelated using a standardized terminology language such as the ICNP numerical coding system (Wieteck, 2008). By assigning the same numerical code to each of these terms or concepts (e.g., pressure injury, pressure ulcer, and decubitus ulcer), the electronic health information system is able to recognize them as synonyms (Wieteck, 2008). Therefore, using a standardized terminology language facilitates the extraction of more accurate data for quality-improvement initiatives, policy development, and research (Wilson, 2013).

The ICN has mapped their ICNP codes to the Systematized Nomenclature of Medicine-Clinical Terms (SNOMED CT) as part of their Harmonization Agreement with the International Health Terminology Standards Development Organization (IHTSDO) (Kim, Hardiker, & Coenen, 2014). Globally, SNOMED CT is considered the most comprehensive terminology language used to facilitate the exchange of health information (National Library of Medicine [NLM], 2016). Through this collaboration, it is also now possible to map the RNAO nursing order sets to SNOMED CT. This is the recommended approach if the order sets are being embedded in an electronic health information system that has SNOMED CT built in.

Consider the importance of embedding specific nursing interventions in the electronic health record as part of the plan of care.

A large academic and research hospital in Ontario, Canada recently embedded RNAO's nursing order sets in Epic. This electronic health information system uses SNOMED CT as a terminology language (IHTSDO, 2017). The staff involved in the implementation were required to cross reference the ICNP codes in the nursing order set to the SNOMED CT codes embedded in Epic (see Table 5.2).

By linking these terminology languages behind the scenes in Epic—for example, when clinicians add a diagnosis to the problem list by selecting an existing term—the corresponding SNOMED CT concept is automatically selected. This cross-referencing enhances the organization's ability to use the technology to provide evidence-based clinical decision support and increase its reporting capabilities (IHTSDO, 2017).

TABLE 5.2 MAPPING ICNP CODES IN NURSING ORDER SETS TO SNOMED CT CODES IN EPIC

NURSING ORDER SET INTERVENTION STATEMENT	ICNP CODE IN THE ORDER SET	ICNP PREFERRED TERM (2015 RELEASE)	SNOMED CT CODE IN EPIC	SNOMED CT FULLY SPECIFIED NAME (2016–01–31 RELEASE)
Assess for infection using clinical assessment techniques	10002821	Assessing susceptibility to infection	370782005	Assessment of susceptibility for infection (procedure)
Obtain a comprehensive health history on admission or initial contact	10030687	Admission Assessment	406152008	Admission assessment (procedure)
Implement diabetic foot ulcer care protocol	10031117	Diabetic Ulcer Care	711027007	Diabetic ulcer care (regime/therapy)
Perform physical examination of affected limb(s) on admission	10032258	Physical Examination	5880005	Physical examination procedure (procedure)

KEY FEATURES AND POTENTIAL BENEFITS

Several key features in the design of RNAO's nursing order sets make them valuable for nurses. First, the order sets are composed of evidence-based, actionable nursing intervention statements. By embedding the nursing order sets within electronic health information systems, nurses will immediately have access to the best available evidence at their fingertips, reducing the research-to-practice gap.

Second, the interventions within the order sets are aligned with each component of the nursing process: assessment, planning, implementation, and evaluation. The American Nurses Association (ANA) describes the *nursing process* as "the common thread uniting different types of nurses who work in varied areas" (ANA, 2013, para. 1). Therefore, using the nursing process as the organizing framework for the nursing order sets ensures their congruence with the typical nursing workflow (Yildirim & Özkahraman, 2011). It is important to note that although the order sets are intended to support nurses' workflow, none of the intervention statements are preselected. This approach ensures that the nurses use the order sets as a clinical decision support resource rather than a substitute for their own clinical decision-making.

Third, each intervention statement in the order set is linked to the practice recommendations from which they were derived. To illustrate this point, consider the subset of the *Reducing Foot Complications for People with Diabetes Nursing Order Set* (RNAO, 2015) shown in Figure 5.4.

The numbers shown in the column with the heading "PR#" reflect the practice recommendations from which the interventions displayed to the left of the column were derived. For example, the intervention statement "assess risk for foot ulceration/amputation at least annually in all clients with diabetes 15 years or older and more frequently for those at higher risk" was derived from practice recommendations "1.0-2.0."

The actual practice recommendations published in the BPG (RNAO, 2007) are:

1.0 "Physical examination of the feet to assess risk factors for foot ulceration/amputation should be performed by a healthcare professional;

1.1 This examination should be performed at least annually in all people with diabetes over the age of 15 and at more frequent intervals for those at higher risk; and,

2.0 Nurses should conduct a foot risk assessment for clients with known diabetes. This risk assessment includes the following: history of previous foot ulcers; sensation; structural and biomechanical abnormalities; circulation; and self-care behaviour and knowledge."

In addition to linking the practice recommendations to the intervention statements, the order sets provide a summary of the supporting evidence that is also accessible at the point of care.

Fourth, intervention statements in the order set that are supported by the strongest evidence (e.g., meta-analyses, systematic reviews of randomized controlled trials, or randomized controlled trials) are displayed in bold font. One example of this feature is evident in the intervention "Teach about basic foot care" in Figure 5.4, which appears in bold font indicating strong evidence for this intervention.

Reducing Foot Complications for People with Diabetes Nursing Order Set	PR#
See Associated Document for Practice Recommendations (PR). Interventions printed in **bold font** are supported by the strongest evidence.	
Assessment	
❑ **Assess risk for foot ulceration/amputation at least annually in all clients with Diabetes 15 years or older and more frequently for those at higher risk (10042678)** • Obtain history and perform physical examination • The foot risk assessment includes: history of previous foot ulcers; sensation; structural and biomechanical abnormalities; circulation; and self-care behaviour and knowledge Associated Documents: Risk Assessment Algorithm; Diabetes Foot Assessment/Risk Screening Guide; Use Of The Semmes-Weinstein Monofilament and Structural and Biomechanical Abnormalities	1.0-2.0
❑ Classify and document risk for foot ulceration/amputation • Based on assessment of risk factors, clients should be classified as "lower" or "higher" risk for foot ulceration/amputation • Inform client of his/her foot risk status	6.0 3.0
Planning	
❑ Refer clients at higher risk for foot ulceration/amputation to their primary care provider/ specialized (10032567) • Diabetes or foot care treatment/education teams as appropriate	6.0
Implementation	
❑ **Teach about basic foot care (10042825)** • All people with Diabetes should receive basic foot care education; reinforce at least annually Associated Document: Basic Foot Care Education For People With Diabetes	4.0-5.2

FIGURE 5.4 Subset of *Reducing Foot Complications for People with Diabetes Nursing Order Set*. Reprinted from RNAO, 2015.

Fifth, the nursing order sets include associated documents that are clinical decision support resources derived from the guidelines. Associated documents include resources such as decision trees, algorithms, risk factors, signs and symptoms of adverse conditions, and educational material. Below is an example of an associated document contained in the nursing order set *Working with Families to Promote Safe Sleep for Infants 0–12 Months of Age* (RNAO, 2016d). Associated documents can be integrated into electronic health information systems as reference documents and made available to clinicians whenever and wherever they are needed.

ASSOCIATED DOCUMENT USED AS AN EDUCATIONAL RESOURCE

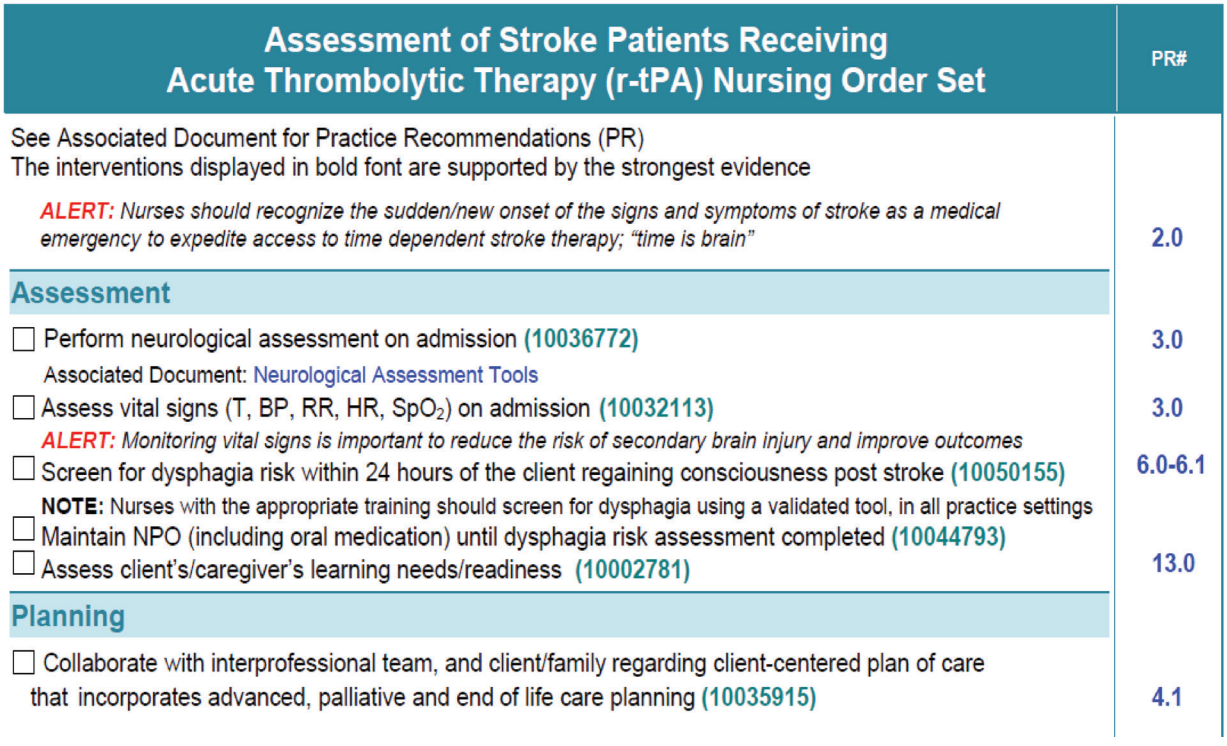
Strategies to create safe sleep environments for infants:

- Place the infant in a crib, cradle, or bassinet that meets the Canadian safety regulations.
- Keep out any extra items in the sleep environment other than the mattress and a fitted sheet.
- Do not place loose blankets, quilts, or comforters near the infant, between the mattress and the sheet, or under the infant.
- Use caution regarding swaddling of infants.
- Avoid overheating of the infant by placing them in fitted one-piece sleepwear that is comfortable at room temperature and avoid the use of additional blankets.

The sixth feature, ALERTS, promotes the use of technology as an enabler of evidence-based practice. In each order set, ALERTS are displayed in red font to draw attention to specific practices or factors that might jeopardize patient safety. One example from the nursing order set *Assessment of Stroke Patients Receiving Acute Thrombolytic (r-tPA)* (RNAO, 2016c) is: "Monitoring vital signs is important to reduce the risk of secondary brain injury and improve outcomes" (see Figure 5.5). This feature will be particularly useful for nurses using electronic health information systems with more advanced functionality such as triggers and reminders that can be preprogrammed to generate alerts.

A seventh feature is the cross-referencing of the intervention statements in the nursing order sets to the international nursing standardized terminology language (i.e., ICNP). A key advantage of adopting ICNP is the ability to identify synonymous terms and concepts that are used to represent nursing data in electronic health information systems by assigning the same numerical codes to these terms and concepts. ICNP codes are stored in tables built into the technology behind the scenes and referenced as needed when data are extracted for analysis, research, or interoperability—the exchange of information amongst healthcare facilities.

One example of a use case for ICNP codes is the researcher who needs to extract data from different healthcare agencies to perform comparative analyses to establish benchmarks. Another potential use case is the nurse manager who needs to extract and analyze data to evaluate the adoption of a particular evidence-based practice.



Assessment of Stroke Patients Receiving Acute Thrombolytic Therapy (r-tPA) Nursing Order Set	PR#
See Associated Document for Practice Recommendations (PR) The interventions displayed in bold font are supported by the strongest evidence	
ALERT: *Nurses should recognize the sudden/new onset of the signs and symptoms of stroke as a medical emergency to expedite access to time dependent stroke therapy; "time is brain"*	2.0
Assessment	
☐ Perform neurological assessment on admission (10036772)	3.0
Associated Document: Neurological Assessment Tools	
☐ Assess vital signs (T, BP, RR, HR, SpO_2) on admission (10032113)	3.0
ALERT: *Monitoring vital signs is important to reduce the risk of secondary brain injury and improve outcomes*	
☐ Screen for dysphagia risk within 24 hours of the client regaining consciousness post stroke (10050155)	6.0-6.1
NOTE: Nurses with the appropriate training should screen for dysphagia using a validated tool, in all practice settings	
☐ Maintain NPO (including oral medication) until dysphagia risk assessment completed (10044793)	
☐ Assess client's/caregiver's learning needs/readiness (10002781)	13.0
Planning	
☐ Collaborate with interprofessional team, and client/family regarding client-centered plan of care that incorporates advanced, palliative and end of life care planning (10035915)	4.1

FIGURE 5.5 ALERTS in a stroke nursing order set.
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RNAO's nursing order sets simplify the evaluation of guideline implementations by seamlessly capturing data on key process and outcome measures for further analysis using data analytics software. RNAO's Nursing Quality Indicators for Reporting and Evaluation (NQuIRE) is one example of a data analytics system. It is used by Best Practice Spotlight Organizations (BPSO), which are healthcare organizations or academic institutions from around the world that have entered into a formal agreement with RNAO to implement BPGs (three in international sites and five in Canadian sites) over a 3-year period and evaluate the impact. NQuIRE collects organization-level data on human resource structural indicators as well as nursing-sensitive process and outcome indicators designed to systematically monitor adoption of the practice changes recommended in the guidelines and evaluate their impact on patient outcomes.

REFLECTION

How might the use of ICNP codes advance nursing practice?

NURSING ORDER SETS IN ACTION

This section showcases nursing order sets in action through an RNAO Canada Health Infoway partnership. RNAO's nursing order sets are vendor neutral. They may be embedded within any electronic health information system, irrespective of the vendor. Since their introduction in 2012, nursing order sets have been implemented by more than 30 healthcare organizations across the spectrum of care including primary care, acute care, home care, and long-term care.

Given RNAO's past successes with Infoway's Peer Leader Model, discussed earlier in this chapter, in 2015 Infoway awarded RNAO funding that allowed them to demonstrate the impact of embedding ICNP-encoded nursing order sets within multiple electronic health information systems to enable automatic data capture and retrieval to support outcome evaluation (Punch, 2017). The main objectives of the project were to train nurse peer leaders across selected project sites to:

1. Promote clinician engagement and adoption of the following advanced clinical e-functions:
   a) e-Clinical decision support: Nursing order sets (embedded in electronic health information systems) that were derived from the following RNAO Best Practice Guidelines:
      - *Assessment and Management of Foot Ulcers in People with Diabetes*
      - *Assessment and Management of Pressure Injuries for the Interprofessional Team*
      - *Strategies to Support Self-Management in Chronic Conditions: Collaboration with Clients*
   b) e-Performance measurement: Technology-enabled data collection and extraction using the ICNP terminology language.
   c) e-Clinical analytics: RNAO's NQuIRE data system to measure the impact of implementing the guidelines.
2. Enhance clinicians' capacity to effectively use patient e-services (i.e., viewing electronic resources) to promote self-management of existing foot ulcers and pressure injuries and prevent the formation of new ones.

Four project sites were selected through a Request for Proposal process, representing home care, long-term care, and two hospital settings. Three of the sites were Designated BPSOs (see Chapter 6).

The project was a resounding success, as depicted in the Infographic on the RNAO Nurse Peer Leader Network Project, displayed in Figure in 5.6. The image shows project details and outcomes from provider, organization, and patient perspectives. As demonstrated, provider and organizational outcomes included integrating nursing order sets in four different types of electronic health information systems; enhancing provider knowledge and expertise; and strengthening evidence-based practice—in assessment, planning, sustained practice change, and evaluation—through technology support. In addition, for patients, results showed improvements in wound healing time and reduced risks and complications, all leading to higher quality of life.

REFLECTION

In what ways do nursing order sets embedded in the electronic health record support consistent use of evidence-based practice?

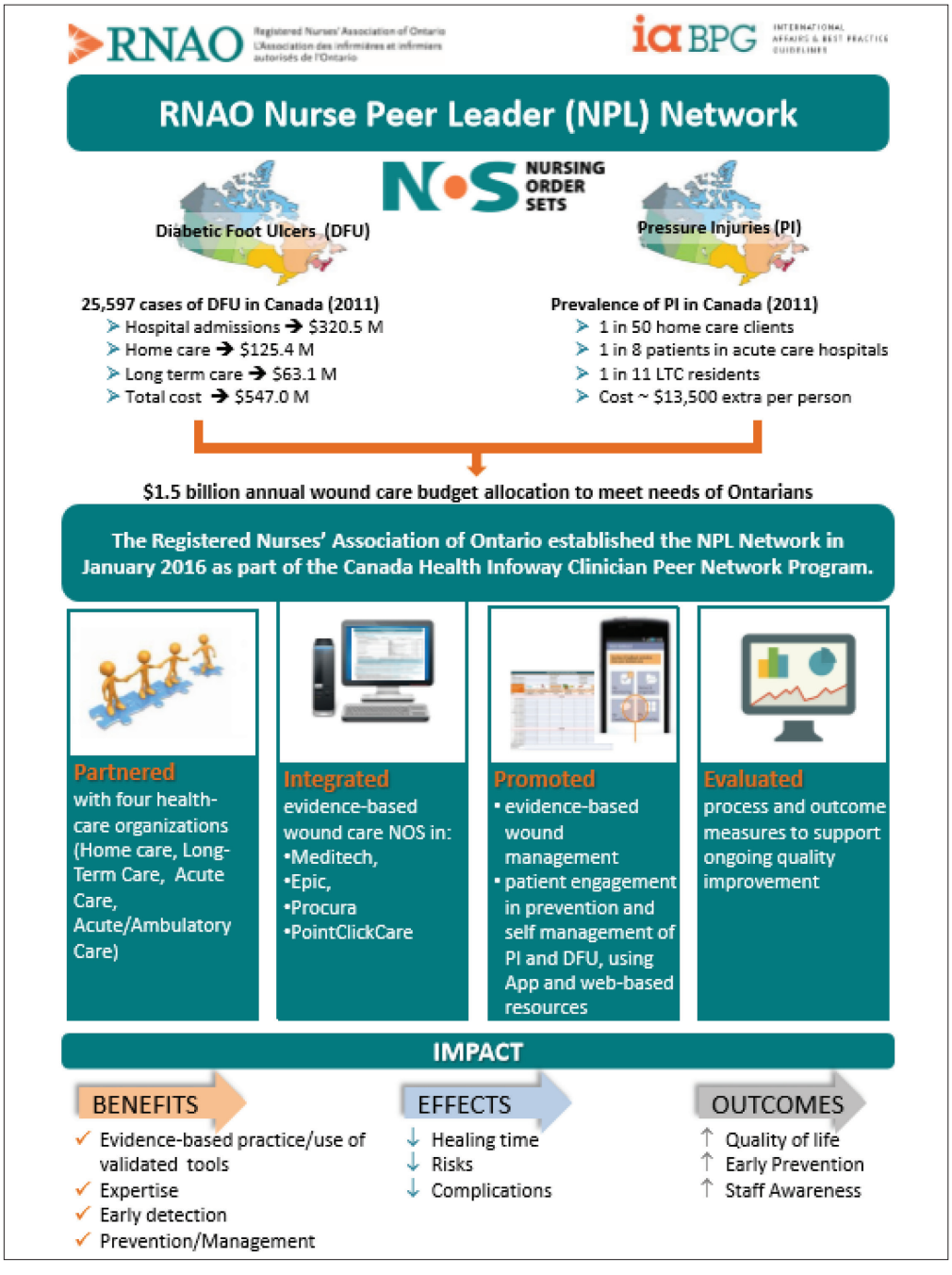

FIGURE 5.6 Infographic on RNAO Nurse Peer Leader Network Project.

NURSING ORDER SET CASE STUDIES

The following case studies provide examples from three healthcare organizations that were part of the RNAO Nurse Peer Leader Network Project. Each case highlights a different focus the organizations took in bringing the project to life in their context. Case 1, a home care setting, used the evidence-based nursing order set to design an app to promote self-management of foot ulcers in patients with diabetes. Case 2 features an acute care setting in which evidence-based practice is facilitated by embedding the nursing order sets for three BPGs into Meditech, their electronic health information system. In Case 3, a long-term care facility used an innovative nursing order set design that enabled providers to see the assessments and interventions together as a unified care plan, enhancing the nursing process.

CASE STUDY

NURSING ORDER SETS IN HOME CARE

In 2015, RNAO awarded a Canadian home-care agency the BPSO Designation after they met the rigorous requirements of the 3-year candidacy program. To date, the agency has implemented seven BPGs across their organization. Four of these guidelines were implemented with the support of nursing order sets embedded within Procura, their electronic documentation system. By embedding RNAO's ICNP-encoded nursing order sets within Procura, direct-care clinicians use the evidence-based intervention statements to generate care plans and inform their practice. In addition, the nursing order sets provide increased ability to collect and monitor data for key process and outcome indicators to support continuous quality improvement (RNAO, 2017b).

Recently, the home care agency utilized an innovative approach to implement the nursing order set *Strategies to Support Self-Management in Chronic Conditions: Collaboration with Clients* (RNAO, 2016b). They designed, developed, and implemented a self-management app and a self-management health coach portal based on the content of the nursing order set. Their goal was to use technology as an enabler of evidence-based wound management for clients with diabetes-related foot ulcers.

The app was piloted in one branch of the home care agency for 5 months. Prior to the implementation of the app, no clients were engaged in the self-monitoring of their foot ulcers.

After the deployment of this resource in the pilot site, there was a consistent upward trend from 10 clients in the first month to 18 clients engaged in this activity when the project ended. Through the use of this innovative approach, clients had direct access to a health coach who provided self-management support and monitored their progress (RNAO, 2017b).

Clients used the self-management app to (RNAO, 2017b):

- Complete a self-management readiness assessment questionnaire that includes a depression screening tool and questions to assess their knowledge of diabetes and foot care
- Identify goals with their health coach
- Self-monitor their symptoms
- Access relevant educational resources
- Enter and track their appointments
- Speak or send a message directly to their health coach

CASE STUDY

NURSING ORDER SETS IN ACUTE CARE

A Canadian acute care hospital that was also awarded the BPSO Designation in 2015 has implemented nine of RNAO's BPGs to bridge its research-to-practice gap, ensuring that the most current available knowledge is being applied to the care provided to patients and families (RNAO, 2017b). The implementation of three of these guidelines was facilitated by embedding the corresponding nursing order sets within Meditech, the hospital's electronic health information system.

Embedding the intervention statements into the Meditech system made it easy for clinicians to use RNAO's evidence-based guideline and order sets to prevent and manage pressure injuries. Furthermore, the ICNP codes that were built into the back end of the system enabled the organization to collect data for key process and outcome indicators as clinicians completed their electronic documentation. This implementation strategy also simplified the process of extracting meaningful data to evaluate the impact of the guideline on practice and health outcomes (RNAO, 2017b).

The data obtained from the system to evaluate the process and outcome measures revealed that patients with pre-existing pressure injuries had their wounds assessed on admission 100% of the time. There was also evidence that the monthly average of patients with pressure injuries who received pressure reduction management ranged from 83% to 100% over an 8-month period. The average rate of healing pressure injuries ranged from 25% to 100% monthly. These results provide clear data about which interventions are effective and should be reinforced, and which should be reviewed, revised, and/or refined.

CASE STUDY

NURSING ORDER SETS IN LONG-TERM CARE

A large Canadian for-profit organization implemented nursing order sets in two of its long-term care homes in Ontario (RNAO, 2017b). The order sets were embedded in PointClickCare, the organization's electronic health information system. The organization is not a BPSO.

The nursing order sets were embedded within the care planning methodology as user-defined assessments. This design enabled direct-care staff to view the complete order sets as distinct entities within the system. This design was markedly different compared to other software applications where components of the order sets are typically built as separate entities in the system. For example, assessments are built separately from the related interventions. Therefore, clinicians are seldom aware that these components are part of a nursing order set. In contrast, by building the nursing order sets as user-defined assessments, care providers were able to see the assessments and interventions together in one document. This design also allowed the organization to use an innovative approach to incorporate the ICNP codes into the system on the front end, which increased the staff's awareness of this standardized terminology and provided the added value of using the codes to extract data for ongoing monitoring, evaluation, and continuous quality improvement (RNAO, 2017b).

Care providers readily adopted the nursing order sets, which they affectionately termed "my new best friend." By completing and then checking off the interventions in the nursing order sets, the care providers were assured that the residents were receiving evidence-based care.

RNAO's evidence-based nursing order sets are expediting knowledge translation across sectors, as can be seen through the experiences of these three organizations, which represent three different sectors. Each of these organizations demonstrated that technology-enabled guideline implementation, using nursing order sets as clinical decision support resources, reinforce and sustain evidence-based practice. The innovative use of the order sets in the app in one organization also highlighted the potential for technology-enabled patients' self-management informed by the best evidence. Lastly, ICNP-encoded nursing order sets seamlessy facilitated technology-enabled data collection and retrieval for quality monitoring and evaluation.

EHEALTH BPG: ADOPTING EHEALTH SOLUTIONS

While many of the health resources described herein have been developed with extensive nursing and clinician input and user feedback, this is not always the case. When more attention is paid to "getting it done" rather than to "getting it done right" in relation to eHealth, the system experiences loss of time, money, and opportunities for high-quality healthcare. The next section highlights RNAO's development of a System and Healthy Work Environment BPG to reinforce the importance of nursing and other clinician involvement in eHealth adoption in healthcare.

The eHealth BPG, *Adopting eHealth Solutions: Implementation Strategies*, was incubated early in 2016, during discussions between RNAO and Canada Health Infoway (RNAO, 2017a). The decision was made to partner and produce a BPG to help executive nurses and other key healthcare stakeholders, including clinicians, effectively lead and support the implementation and adoption of digital health solutions across Canada. Infoway's Chief Nursing Executive cochaired the BPG development panel along with a nurse informatics expert and administrative lead in a large urban acute care setting.

REFLECTION

In your workplace, how is technology used to support evidence-based practice? Consider how engaged in eHealth you are or could be in your nursing role.

The evidence-based guideline published by RNAO in February 2017 was specifically designed to enhance the eHealth capacity of (RNAO, 2017a):

- Healthcare leaders, nurses, and other health professionals in practice, education, administration, and informatics to optimize their involvement in the procurement, design, implementation, adoption, and optimization of an eHealth solution
- Healthcare executives and clinical/nonclinical leaders, educators, and administrators at the organization and system levels to effectively identify and address the eHealth education needs of the healthcare workforce
- Government agencies, administrators, and policymakers to identify and implement relevant evidence-based policies that support health system transformation and nationwide health information exchange by addressing known barriers to eHealth adoption at the national and jurisdictional levels

"We believe this guideline is a key resource for healthcare executives, frontline nurses and other healthcare providers, and helps us achieve Infoway's vzision of healthier Canadians through innovative digital health solutions."

–Michael Green
President and CEO
Canada Health Infoway

The guideline was developed by an international and interprofessional panel of experts using RNAO's rigorous and systematic guideline development process. Panel members included patient partners, healthcare executives, nurses, and other health professionals from a range of settings (including informatics, practice, education, research, and policy) (RNAO, 2017a).

All panel members, with the exception of the patient partners, had considerable expertise in eHealth implementations. Furthermore, several had previously been actively involved in implementations that resulted in their organizations attaining Stage 6 or higher on the Healthcare Information and Management Systems Society (HIMSS) Electronic Medical Record Adoption Model (EMRAM). The EMRAM provides an eight-point (0–7) scale to measure the extent to which a healthcare organization uses technology to support care delivery (HIMSS Analytics, 2017). The higher the score on the EMRAM, the closer the organization is to achieving a paperless environment.

The patient partners were chosen because of their personal experiences with the healthcare system and the impacts of receiving care in environments without access to electronic health information. They all supported the use of technology as an enabler to increase clinicians' knowledge and decision-making capacity.

The guideline development process included a systematic review of the peer-reviewed literature and a targeted review of the grey literature to identify the best available evidence to answer the following research questions:

1. What individual- and organizational-level factors contribute to high-quality electronic health information systems and their successful adoption?
2. What education and training do individuals/organizations need to lead and support high-quality electronic health information system implementations and adoption?
3. What system-level factors contribute to high-quality, technology-enabled health service delivery and successful health systems transformation?

Relevant articles and resources published in English from January 2006 to March 2016 were included. A total of 178 peer-reviewed articles and 56 grey literature resources were deemed relevant. Draft guideline recommendations were formulated using the evidence obtained from the literature review. A modified-Delphi technique was employed to obtain panel consensus (i.e., the identity of the panel members was not concealed, but their individual responses to the draft recommendations were concealed from the other members of the group).

The Expert Panel identified 26 evidence-based recommendations that address known micro-level, meso-level, and macro-level barriers to the successful implementation of eHealth solutions. In the BPG, these recommendations are categorized as individual/organization, education, and system/policy.

KEY INDIVIDUAL/ORGANIZATION RECOMMENDATIONS

There are fifteen (15) individual/organization recommendations focusing on micro- and meso-level factors that contribute to the implementation, adoption, and optimal utilization of high-quality eHealth solutions to realize the intended return on investment. These are summarized in the following five bulleted statements (RNAO, 2017a):

- Garner visible executive sponsorship throughout all phases of the Hospital Information System (HIS) implementation.
- Create a specialized chief nursing information officer (CNIO) role as a critical element to advance clinical adoption in healthcare organizations.
- Use formal change and project management methodologies to fully engage relevant stakeholder groups throughout all phases of the implementation for optimal implementation and adoption.
- Incorporate usability processes throughout to enhance individual and organizational efficiencies, effectiveness, and user satisfaction.
- Develop an ongoing post-implementation operational plan that includes data governance structures and processes that support sustainability.

KEY EDUCATION RECOMMENDATIONS

There are four education recommendations that focus on the eHealth education infrastructure required to facilitate the acquisition of informatics competencies by healthcare executives and health professionals. They include (RNAO, 2017a):

- Health organizations and academic institutions will develop an education and training infrastructure that provides opportunities for key stakeholders to develop role-specific informatics competencies.
- Healthcare organizations will facilitate integration of role-specific informatics competencies within executive and professional practice leadership roles using a shared accountability model.
- Nurses and other health professionals will take responsibility for being up-to-date with role-specific eHealth competencies.
- Healthcare organizations will facilitate access to health information, empowering individuals to assume greater responsibility for self-management of their health and to engage in informed dialogue with their health professionals.

KEY SYSTEM/POLICY RECOMMENDATIONS

There are seven system/policy recommendations that address the structure, process, and policy requirements at the macro level to realize the long-term goals of nationwide electronic health information exchange and health systems transformation. They include that national and jurisdictional agencies responsible for eHealth work with key relevant stakeholders and (RNAO, 2017a):

- Develop a comprehensive strategy to achieve nationwide interoperability
- Collaborate to establish an effective governance structure that provides strong, coordinated leadership and works in conjunction with regulatory bodies and professional associations to achieve its eHealth goals
- Provide incentives to foster development of innovative next-generation eHealth solutions
- Develop strategies to mitigate the initial costs for health organizations to adopt eHealth solutions and ongoing financial barriers
- Develop and strategically implement education and training policies to build eHealth capacity in the workforce
- Collaborate with regulatory bodies and professional associations to accelerate the adoption of eHealth solutions
- Ensure that the necessary telecommunications infrastructure is in place in remote communities to support the implementation of eHealth solutions

REFLECTION

How could the eHealth BPG be used in your workplace to enhance eHealth adoption?

The guideline provides structure, process, and outcome indicators to monitor and evaluate the impact and effectiveness of its implementation as well as links to a variety of related tools. Table 5.3 depicts a sample of such indicators for selected recommendations.

TABLE 5.3 STRUCTURE, PROCESS, AND OUTCOME INDICATORS FOR MONITORING AND EVALUATING THE EHEALTH GUIDELINE

STRUCTURE	PROCESS	OUTCOME	TOOLS
RECOMMENDATIONS 1.1-1.2			
■ Executive leadership established a formalized governance structure with roles, responsibilities, and sponsorship to guide and support all phases of the implementation of the eHealth solution.	■ Governance structure established with diverse representation (e.g., interprofessional and cross-functional) and clearly delineated roles and responsibilities.	■ Governance structure supports successful implementation of the eHealth solution.	■ Sample governance structures (see pages 31–32 and Appendix E).
RECOMMENDATIONS 1.3			
■ Organization implemented policies and procedures to support a comprehensive organizational readiness assessment in the early planning phase.	■ Organization completed a readiness assessment that included individual, organizational, and technical dimensions. ■ Organization addressed all gaps identified.	■ Organization demonstrated individual, organizational, and technical readiness.	■ Standardized organizational readiness assessment tool (see page 34 and Appendix F).

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CONCLUSION

Healthcare has scaled a new paradigm since the introduction of eHealth. Globally, eHealth is recognized for its potential to add efficiency to the system as a whole. However, for the system to realize this ideal and engender person-centered care and evidence-based clinical practice, clinicians and patients have to be fully engaged in the design, development, and testing of the resources and tools developed.

This chapter has outlined the work of a professional association in advocating for and enabling clinician and patient engagement in eHealth. The key resources developed by RNAO for clinicians to support technology-enabled evidence-based practice have been described. It is through continued design, development, and use of such resources, and engagement in ongoing research, that we will harness the full power of technology to promote safe, high-quality, evidence-based practice. Finally,

co-creating resources that empower patients and all users of the health system with knowledge and self-care capacity will truly lead us to a person-centered healthcare system.

KEY MESSAGES

- The RNAO BPG app enables nurses to access the practice recommendations, related evidence, and teaching tools at their fingertips.
- Nursing Order Sets expedite knowledge translation.
- ICNP codes simplify the evaluation of guideline implementations by seamlessly capturing data on key process and outcome measures.
- There is strong evidence to support the value add of using a systematic, participatory approach to eHealth adoption in healthcare.

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