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

ia BPG INTERNATIONAL AFFAIRS &
BEST PRACTICE GUIDELINES

NQuIRE®

BPSO BEST PRACTICE
SPOTLIGHT
ORGANIZATION

Nursing Quality Indicators for Reporting & Evaluation® (NQuIRE)
Best Practice Spotlight Organization® (BPSO)

NQuIRE

DATA QUALITY & DATA MANAGEMENT
GUIDE

for BPSOs

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1.0 INTRODUCTION, BACKGROUND AND PURPOSE

1.1 NQuIRE, a unique data system

The Registered Nurses' Association of Ontario (RNAO) has been a leader in promoting and developing evidence-based nursing practice locally and internationally. RNAO's International Affairs and Best Practice Guidelines Centre (IABPG) has a unique and comprehensive approach of developing best practice guidelines (BPG), providing support to organizations to implement these BPGs through the Best Practice Spotlight Organization® (BPSO®) designation, and evaluating their impact. In order to support BPSOs in monitoring and evaluating BPG implementation, in 2012, the international Nursing Quality Indicators for Reporting and Evaluation® (NQuIRE®) data system was created. In April 2014, NQuIRE reporting became a mandatory requirement for all BPSOs. NQuIRE is the only international data system known with BPG-specific nursing sensitive process, outcome, and human resource structure indicators. The nursing-specific process indicators measure the implementation of practice recommendations from clinical BPGs. This data system collects organizational demographic data and nursing-specific structure indicators that provide insight into organizational contextual structures of BPSOs. NQuIRE is unique as it is a data system which collects de-identified aggregated data at the implementation site-level from BPSOs. Thus, the system does not collect confidential person-specific information.

NQuIRE supports BPSOs in the evaluation and monitoring of BPG implementation by producing quarterly reports and dashboards of their monthly data, which BPSOs can utilize and share within their organization and for reporting requirements for BPSO designation. In the near future, NQuIRE will also provide BPSOs with the ability to compare their BPSOs with other like-BPSOs.

As NQuIRE is an evaluation tool for BPSOs, it is vital that attention is paid to data quality to ensure high quality data are being used to evaluate improvements in nursing practice and health outcomes. The quality of the data can be affected by a multitude of factors including, but not limited to, the existing processes for data collection, the knowledge and skill level of those individuals collecting data, and the resources available to support standardized data collection, etc (Azimaee, Smith, Lix et. al, 2015). The use of poor data can lead to inaccurate information and poor decision-making (Loshin, 2012; Strome, 2013). Therefore, it is vital to identify and resolve any potential or actual systemic challenges that may affect the quality of NQuIRE data and propose strategies to address such challenges.

In order to prepare BPSOs to be able to compare with like-organizations and enhance the quality of NQuIRE data and its usefulness, the NQuIRE team has made concerted efforts to refine the system, internal processes and policies. One such effort is the development of the NQuIRE Data Quality Framework and Strategy (NDQFS). The NDQFS provides an overview of how to improve data quality for NQuIRE through all the multi-factorial elements that influence data quality for NQuIRE, which are both internal at RNAO (i.e. BPG program elements) and

external (i.e. BPSOs). All the efforts are focused on further supporting BPSOs in order to maximize the quality data entered into the NQuIRE data system.

To that end, it is vital to develop a BPSO NQuIRE Data Quality & Data Management Guide (as part of the broader strategy of NDQFS)[1] that will provide a systematic guide for participating in NQuIRE. This guide will give BPSOs the necessary steps including: registration of BPSOs' profiles in the NQuIRE data system; indicator selection; identification and registration of BPSOs' implementation sites; identification of sources of data; understanding of sampling, data collection processes and auto-generated NQuIRE reports, in an effort to maximize the quality of data in the data system.

1.2 Background

1.2.1 NQuIRE as a mandatory requirement for BPSOs

Participation in NQuIRE is a mandatory requirement to attain and maintain a BPSO designation. BPSOs from all sectors, locally and internationally, submit aggregated data at the organization and implementation-site levels (mostly secondary data[2]) to the NQuIRE data system for secondary purposes, such as evaluating BPG implementation, accountability for BPSO designation, and over time, for broader research purposes. Both at the organization level and implementation site levels, NQuIRE includes demographic data and sector-specific characteristics in order to categorize and create filters for comparability and understand the BPSO environment where the BPGs are being implemented.

BPSOs are engaged in various data collection processes and data sources to collect data. The data environment for NQuIRE is complex and challenging due to the number of stakeholders (both from BPSOs and RNAO) that are involved to collect, extract, aggregate, submit, review, analyze, and use this aggregated secondary data.

Given that data quality begins with the source, it is important to identify the risk for and prevent collection of flawed data (Strome, 2013). For NQuIRE, it is important that all BPSOs are aware of the role they play in ensuring quality data are being submitted. It is the intention of this guide to enhance BPSOs' participation in NQuIRE to ensure the highest quality data are entered into the data system. Understanding what a data life cycle is, in the context of NQuIRE participation, and how that translates into creating a comprehensive data management plan is crucial to ensuring high quality data.

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[1] This is in keeping with *Recommendation 1* under section 4.3.4 of the NQuIRE Data Quality Framework and Strategy. The BPSO NQuIRE Data Quality & Data Management Guide forms part of operationalizing the NQDFS.

[2] Secondary data are individual or aggregated data derived from primary data for secondary uses such as summary reports, reporting for accreditation, quality improvement initiatives, research, etc. (Abdelhak, Grostick, Hankin, & Jacobs, 2007; Institute for Work & Health, 2015).

1.2.2 Data Life Cycle Management

Data life cycle management is the flow and processes where data are managed from creation to retirement. To ensure highest NQuIRE data quality it must be managed throughout the data life cycle (see Figure 1, adapted from Faundeen, Burley, Carlino, Govoni, Henkel, Holl, Hutchison et al. (2013). For our context, the data life cycle model has been adapted to encapsulate the processes relevant for NQuIRE participation by BPSOs. It starts with creating a *plan* for data management, including the actions taken to identify data needs (i.e. funding, type of resources, etc.). The plan determines the 'metadata' (i.e. description about the data) collected and the documentation in place for each step throughout the life cycle. The plan also sets the stage for data quality which also needs to be managed at every step. Next, *create* involves the establishment of standardized data collection processes. The *process* step involves the organization, verification, extraction, integration, and transformation of data in preparation for analysis. To *analyze* the data, quality assurance processes need to be established in order to conduct statistical data analysis and correctly interpret the data. The *preserve* step involves keeping the data for a specific time period for future use (*re-use*). The final step is to *share* the data in the form of a report or publication while continually ensuring that the cross-cutting model elements including, metadata and documentation, implementing quality assurance measures, and ensuring data security are undertaken at all times throughout the life cycle (Faundeen, Burley, Carlino, Govoni, Henkel, Holl, Hutchison et al., 2013; Corti, Van den Eynden, Bishop, & Woollard, 2014). Given the sequence that this data life cycle model provides, Figure 1 will be used as the organizing framework for this Data Quality and Data Management Guide.

Figure 1: Data Life Cycle
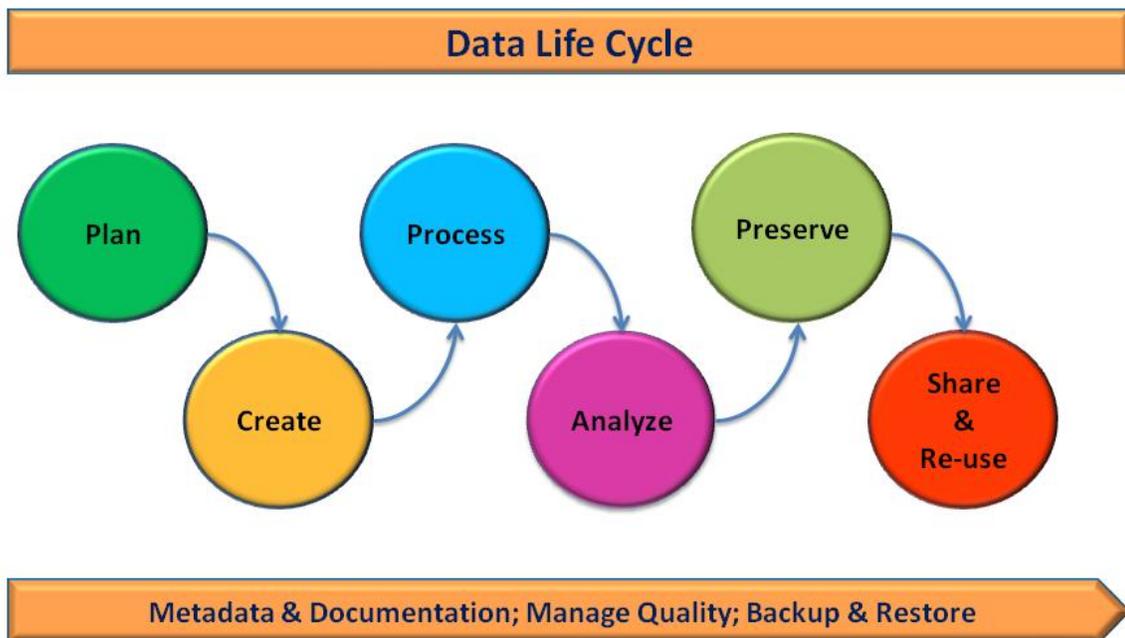
Adapted from Faundeen, Burley, Carlino, Govoni, Henkel, Holl, Hutchison et al. (2013)

1.3 Purpose of this document

This Data Quality and Data Management Guide supports BPSOs in monitoring and evaluating BPG implementation using the Nursing-sensitive Quality Indicators for Reporting & Evaluation (NQuIRE®). This guide support a BPSO's systematic participation in NQuIRE by providing key directions for registration, indicator selection, data collection, data submission, data interpretation and utilization. This guide will provide BPSOs the considerations for all stages of the evaluation process, and ultimately be successful in BPG evaluation via NQuIRE. The guide also incorporates practical exercises, tips, and examples that assist BPSOs to create the necessary infrastructure that supports collecting quality data for NQuIRE.

Data quality is a multi-dimensional concept that is contingent on the needs of the user, i.e. "fitness for use" as coined by Wang and Strong (1996). The guide is intended to highlight the critical steps needed in data collection processes, indicator selection, implementation site selection and overall evaluation of BPG implementation using NQuIRE. The guide reviews the resources available to BPSOs and encourages BPSOs to carefully plan ahead for NQuIRE.

As a reminder, BPSOs are encouraged to review the NQuIRE Data Entry System User Manual (recent version September 2016) located in the NQuIRE website (https://nquire.rnao.ca/) and the NQuIRE Glossary prior to working through the guide. Using the NQuIRE user manual and glossary together with this guide will help ensure data entered into the NQuIRE system is of the highest quality. Table 1 shows a list of useful resources available.

Table 1: List of NQuIRE Resources

List of NQuIRE Resources
1. **NQuIRE Getting Started Guide (see Appendix A)**
2. **NQuIRE Data Entry System User Manual** *
3. **Data Quality and Data Management Guide for BPSOs** *
4. **NQuIRE Training Videos** *
5. **Data Dictionaries** *
6. **NQuIRE Glossary** *
7. **Data Submission Schedule** *
8. **Data Import Template Reference** *
Available on NQuIRE website

1.3.1 Overview of this document:

This guide is arranged in sections to follow the steps in the data life cycle, described in section 1.2.2, in order to support the creation of a comprehensive data management plan and ensure high quality data:

- **Plan (2.0 Plan for NQuIRE)**
- **Create (3.0 Create data for NQuIRE)**
- **Process (4.0 Process data for NQuIRE)**
- **Analyze (5.0 Analyze NQuIRE data)**
- **Preserve (6.0 Preserve NQuIRE data)**
- **Share & Re-use (7.0 Share & Re-use NQuIRE data)**
- **Conclusion**

2.0 PLAN FOR NQuIRE

This section guides BPSOs through the necessary planning required prior to initiating data creation for NQuIRE (refer to Figure 2). The supports provided to BPSOs are highlighted along with who should comprise the NQuIRE team for BPSOs. Once BPSOs have identified key members of their NQuIRE team, planning for NQuIRE registration can begin. The responsibilities of BPSOs regarding NQuIRE are outlined, along with ways in which NQuIRE communicates update/changes, and the necessary actions required by BPSOs. The next phase of planning for data creation involves understanding how to select a BPSO implementation site and appropriate indicators to collect for NQuIRE. The next steps in planning process include planning for data processing, analyzing, preserving, and sharing and re-using NQuIRE data.

Figure 2: Data Life Cycle: Plan
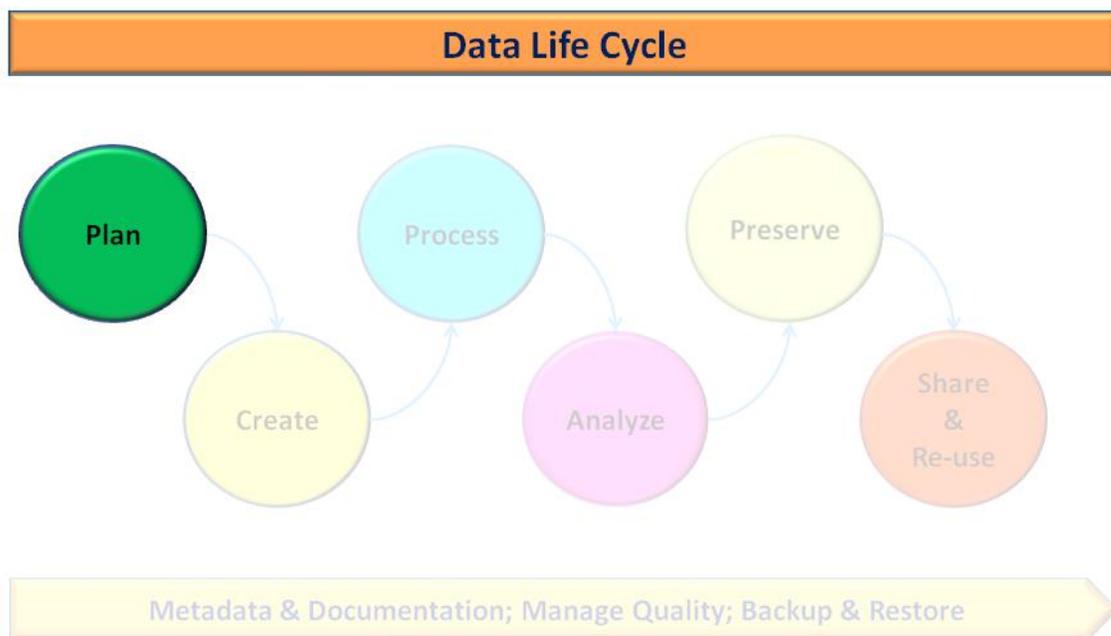
Adapted from Faundeen, Burley, Carlino, Govoni, Henkel, Holl, Hutchison et al. (2013)

2.1 RNAO's Support to BPSOs

RNAO launched NQuIRE in 2012. On April 2014, it became mandatory for all BPSOs, whether pre-designate or designates, to meet the minimum participation requirements set out in the BPSO Terms & Conditions (i.e. BPSO Agreement). This Guide will support all organizations in meeting their contractual NQuIRE requirements for designation and ensure quality data are submitted to NQuIRE.

In planning, BPSOs should ensure that they can successfully participate in NQuIRE and utilize it as an evaluation tool for the BPSO activities. ***For BPSOs new to NQuIRE, it could take up to 6 months to set-up, collect, and report data to the NQuIRE data system***. It is important to collect and submit pre-implementation data, which requires BPSOs to select NQuIRE indicators before implementation of recommendations begin; this process allows BPSOs to measure improvement using NQuIRE. Refer to the NQuIRE Getting Started Guide for a timeline checklist to support introduction into NQuIRE (see Appendix A).

2.1.1 Pre-designate BPSOs

In the first year, pre-designate BPSOs are provided with training and support through webinars, one-on-one consultations and site visits, as necessary, along with resources in order to support participation in NQuIRE. Following the first year, the RNAO NQuIRE team will provide support as needed by BPSOs as they implement new BPGs and plan for evaluation using NQuIRE.

2.1.2 Designate BPSOs

Designate BPSOs new to NQuIRE are provided with training similar to pre-designate training identified above. Once established in NQuIRE, Designate BPSOs are provided with ad hoc support for NQuIRE along with webinars and resource documents to facilitate their ongoing participation in NQuIRE.

2.1.3 BPSO Hosts

For international BPSO Hosts, the BPSO Host receives the support, resources and training from RNAO, and is responsible for submitting data to NQuIRE on behalf of the BPSOs under their direction.

2.1.4 RNAO NQuIRE team support to BPSOs

BPSOs are encouraged to contact the NQuIRE team through the nquire@RNAO.ca email address for troubleshooting or questions. Once the email is received, the appropriate person from the team will respond. If necessary, a BPSO NQuIRE consultation can be arranged.

2.2 Select and Identify NQuIRE team

Identifying your BPSO NQuIRE team will be iterative as you develop processes for selecting indicators, identifying data sources, collecting data, submitting data, and interpreting and using data. Revisit this section throughout the process to ensure the right person(s) are involved in each part of the process. This is an important part of planning for NQuIRE and identifying the right person for each part of the data life cycle can avoid challenges down the road. It is important to have each of these roles represented on the team however for smaller BPSOs it may not be possible to have all these staff roles within their organization in which case individual team members may play multiple roles as well. Figure 3 below provides an overview of the key players needed to be part of a BPSO's NQuIRE team, where the BPSO Lead User plays a dominant role. It is possible that some BPSOs may not require those identified in Figure 3; however, to adequately plan for NQuIRE participation, it is important for BPSOs to explore the resources available within their organization early on in the process.

Figure 3: Key members of a BPSO's NQuIRE team

The BPSO lead user for NQuIRE, identified as a Registered Nurse as per the NQuIRE Data Usage Agreement and often is the BPSO lead, is the most integral member of the BPSO's NQuIRE team. This individual is at the centre of the success of a BPSO being able to effectively use NQuIRE as an evaluation tool for BPG implementation. Hence, in Figure 3, the BPSO lead user along with the BPSO Implementation site user(s) who often are also the BPSO/BPG lead(s) are positioned in the centre—as the big yellow bubble—working in collaboration with the rest of the BPSO's NQuIRE team. In order to ensure success in NQuIRE, the BPSO lead user, implementation site user(s) and BPSO/BPG lead(s) require the support of a number of other individuals referenced in Figure 3. Table 2 below is a list of roles and responsibilities related to the roles identified in Figure 3 necessary for a successful NQuIRE team. It must be noted that in some organizations, in absence of identified implementation site user(s), the BPSO lead user also assumes the additional responsibilities of entering data for all implementation sites.

Table 2: BPSO's Roles & Responsibilities for NQuIRE

Role(s)	Responsibilities
BPSO lead user, Implementation site user(s), BPSO/BPG lead(s)	• Identify BPGs being implemented • Align BPG implementation plan with NQuIRE (i.e. ensure data collection coincides with BPG implementation) • Review Data Dictionaries • Select NQuIRE indicators • Complete Registration in NQuIRE • Identify data sources • Standardize data collection • Review data prior to submission to NQuIRE • Review NQuIRE reports & dashboard • Interpret and share NQuIRE reports & dashboard within organization including frontline staff involved with BPG implementation
Senior management	• Sign BPSO and NQuIRE agreements • Provide resources (i.e. funding & human resources capacity) • Provide support (i.e. working relationships with other departments) • Communication of BPSO contractual requirements • Monitor progress through NQuIRE reports & dashboard
Clinical Informatics, IT, and Decision Support	• Identify data sources • Ensure electronic health record can capture data needed for NQuIRE (only applicable if electronic documentation systems in place) • Ensure data can be extracted for NQuIRE • Automate data extracted from electronic health record to be imported into NQuIRE data import template
Nursing Staff	• Data collection via paper chart and/or electronic health records (i.e. documentation) • Minimize data collection errors through standardized data collection. (Some BPSOs use RNAO Nursing Order Sets (NOS) as a standardized BPG implementation tool that can facilitate data extraction from BPSOs' paper and/or electronic health systems/records) • Monitor progress via NQuIRE reports & dashboard, shared via the BPSO lead user
Professional Practice Leads, Quality Improvement Team	• Identify BPGs being implemented in conjunction with BPSO lead user and BPG lead(s) • Align BPG implementation plan with NQuIRE • Review Data Dictionaries • Select NQuIRE indicators • Identify data sources • Standardize data collection (i.e. documentation) • Monitor progress via NQuIRE reports & dashboard, shared via BPSO lead user

Role(s)	Responsibilities
	• Interpret & share NQuIRE reports & dashboard within organization
Other Departments	• Human Resources, Finance and/or payroll departments may provide support in sourcing data for HR structure indicators
Interprofessional team members	• Depending on their involvement, they may play some of the roles outlined above

As mentioned above, depending on the organization, all roles outlined above may not be filled. The key is to ensure you have clear responsibilities outlined along with necessary resource personnel to have an effective NQuIRE team. Each member of the team has specific responsibilities towards the quality of the data being submitted to NQuIRE. Data stewardship refers to the accountability of those involved with the data through its life cycle from creation to retirement and ensuring appropriate use of the data (i.e. minimize the risk of harm) (Kanaan and Carr (2009). Thus data stewardship is required at every step of the data life cycle and for overall data management.

2.3 Planning for Registration in NQuIRE

After becoming familiar with the demo NQuIRE website (link http://demo.nquire.RNAO.ca/), BPSO lead users receive an invitation to the live NQuIRE data system (https://nquire.RNAO.ca/). The BPSO lead will first register the organization and key demographics in the data system. The data system has a total of four types of profiles which need to be completed prior to being able to submit indicator data to NQuIRE, which are outlined below in Table 3. Table 3 provides an overview of the responsibilities of users identified in Figure 2, particularly the dominant user(s), for each profile type. The BPSO lead is responsible for adding BPSO implementation site users to the system and sending an invitation through the BPSO managed implementation sites tab. BPSOs have two options when determining who will submit data to NQuIRE. First the BPSO lead user can submit data for all implementation sites and by so doing assumes the management of the implementation sites in NQuIRE. The second option is to have each implementation site user submit data for their designated implementation site directly to NQuIRE.

Table 3: User and Profile Registration Responsibility for NQuIRE

NQuIRE Profile Type	Tasks for BPSO lead user in NQuIRE registration	Tasks for BPSO Implementation site user in NQuIRE registration
1) BPSO Organization Profile	✓	n/a
2) BPSO Comparison Profile	✓	n/a
3) BPG Indicators Profile	✓	n/a
4) BPSO Implementation Site Profile(s)	✓	✓

Please refer to the *NQuIRE Glossary* to assist you in understanding the definitions data fields and thereby selecting all applicable options for your organization. The *NQuIRE glossary* defines all the required fields for the four profiles (BPSO Organization Profile; Comparison Profile, Indicators Profile and Implementation Site Profile) as seen in Table 3, and the *NQuIRE User Manual* in conjunction with available training videos (https://nquire.rnao.ca/training) provide step-by-step technical instructions on how to register in NQuIRE.

2.3.1 BPSO Organization Profile

The completed BPSO Organization profile provides the demographic characteristics which are then used as filters for comparability reports. The BPSO Organization Profile is the BPSO Lead user's responsibility to complete and to keep up-to-date.

2.3.2 BPSO Comparison Profile

The BPSO Comparison profile provides the BPSO an opportunity to determine whether to participate in comparative reporting or not. BPSO Comparison reports will provide BPSOs the opportunity to compare themselves with like BPSOs. BPSOs will be able to select the pool of BPSOs to compare to using a list of filters. These filters are designed to allow BPSOs to customize their comparison pool without identifying specific-BPSOs.

2.3.3 BPG Indicators Profile

The BPG Indicators profile enables a BPSO to plan and select for indicators as an organization and inform RNAO NQuIRE team of their selection. The BPG indicators profile is completed once the indicator selection process has been completed by the BPSO. The indicator selection process is discussed in section 2.5.4 and 2.5.5 in conjunction with *NQuIRE Data Dictionaries*. The BPSO lead user completes this section and selects which indicators will be reported to NQuIRE (refer to *NQuIRE User Manual* for details on completing this profile). This profile provides NQuIRE an overview of which BPGs are being implemented and which indicators are being collected at each BPSO. It is the responsibility of the BPSO Lead user account to keep this up-to-date. RNAO recommends that this profile be reviewed annually and with every new BPG being implemented or the addition of a new BPSO implementation site. BPSO lead users select the number and type of indicators in NQuIRE as outlined in the BPSO agreement. The indicators selected in this profile need to match the data being submitted for all implementation site profiles. Once indicators are selected during a designated implementation period of a BPG, the indicators must be collected for the course of implementation or BPSO agreement term. As well, indicators are created specific to an edition of a BPG and hence a Data Dictionary for a previous edition of a BPG cannot be used for a revised edition of the BPG. It is possible that indicators may not change however BPSOs are required to select indicators from the appropriate Data Dictionary only.

2.3.4 BPSO Implementation Site Profile(s)

The BPSO Implementation Site Profile is first completed by the BPSO lead and at the same time the BPSO implementation site users are registered, if applicable. Some BPSOs prefer to have a single user submit data for all implementation sites, while other BPSOs prefer to have implementation site user(s) responsible for their respective site(s). The decision to have a single

user versus multiple users is contingent on the selected data submission method i.e. the online web form versus data import template. Please refer to the *NQuIRE User Manual* for detailed instructions on completing this profile and section 2.5.1 of this document.

2.4 Updating BPSO profiles annually

The BPSO profiles (BPSO organization profile, BPG indicators profile, BPSO comparison profile, and BPSO implementation site profiles) should be updated annually in order to ensure that, for retrospective analysis, the information stored in the NQuIRE data system is accurate and representative of your organization. BPSO profiles should also be updated following NQuIRE data system enhancements or changes. BPSOs will be notified of the changes and directed to update the appropriate profile data once they login to the data system.

2.4.1 NQuIRE account user changes

BPSOs should ensure that all account users (lead user and implementation site users) remain current or that accounts are regularly updated to receive notifications from NQuIRE. In order to update an account user simply send an email to nquire@RNAO.ca and refer to *NQuIRE User Manual* for further details regarding account users. This information is needed in order to effectively communicate any updates, changes, or follow-up and ensure your organization is always informed of the most up-to-date information related to NQuIRE.

2.4.2 How are NQuIRE enhancements, changes, and updates shared with BPSOs?

Table 4 below provides an overview of the types of communications RNAOs NQuIRE team will use for each of the NQuIRE components and the necessary action required by BPSOs.

Table 4: RNAO NQuIRE Communication to BPSOs & Required Action by BPSOs

NQuIRE Components	RNAO NQuIRE communications to BPSOs					Actions required by BPSOs				
	NQuIRE site homepage	E-mail to BPSO lead user	NQuIRE site recent changes	Data audits follow-up	Webinar	Review RNAO communication	Complete requirements	Review documents	Align data collection	Provide feedback
Invitation to Register in Demo Site		✓				✓	✓			
Invitation to Register in Live Site		✓				✓	✓			
BPSO Organization Profile	✓		✓	✓	✓	✓	✓		✓	✓
BPG Indicators Profile	✓		✓	✓	✓	✓	✓		✓	✓
BPSO Implementation Profile	✓		✓	✓	✓	✓	✓		✓	✓
Data Dictionaries (i.e. indicators)	✓		✓		✓	✓		✓	✓	✓
Data Import template	✓		✓		✓	✓	✓		✓	✓
Data submission web form	✓		✓		✓	✓	✓		✓	✓

NQuIRE Components	RNAO NQuIRE communications to BPSOs					Actions required by BPSOs				
	NQuIRE site homepage	E-mail to BPSO lead user	NQuIRE site recent changes	Data audits follow-up	Webinar	Review RNAO communication	Complete requirements	Review documents	Align data collection	Provide feedback
NQuIRE Reports	✓	✓	✓	✓	✓	✓				✓
Dashboard	✓	✓	✓		✓	✓				✓
Draft submission reminder prior to quarterly submission deadline *The email is directed to the user (i.e. the BPSO lead user/implementation site user) submitting the data		✓				✓				

2.4.3 RNAO NQuIRE team support to BPSOs

BPSOs are encouraged to contact the RNAO NQuIRE team through the nquire@RNAO.ca email address for any troubleshooting or questions. Once the email is received, the appropriate person from the team will respond and either address your concerns via email or organize a BPSO consultation for more in-depth discussions if required.

2.5 Plan for Data Creation

In order to plan for NQuIRE data throughout its life cycle, planning for data creation is crucial. This initial planning will allow BPSO's to begin identifying data sources, target populations, and the necessary documentation needed to create/collect data for NQuIRE. The plan for data creation starts with selecting implementation sites for data collection, identifying and selecting appropriate NQuIRE indicators and identifying whether it's possible to collect pre-implementation data.

2.5.1 BPSO Implementation Site Selection Process

A BPSO Implementation Site is the unit/ward/program/service/clinic/office where the BPG is being implemented. When registering implementation sites, ensure that they accurately represent the actual sites where the BPG is being implemented. The naming of implementation site should match the naming convention used in an organization for units/wards/clinics/home areas/etc (BPSO implementation site profile is described in section 2.3.4). Table 5 below outlines examples of BPSO Implementation site selection and naming in NQuIRE across sectors.

Table 5: Examples of BPSO Implementation Sites by BPSO Type

Type of BPSO (i.e. health sector)	BPSO Implementation Site		
	Type	**Description**	**BPSO implementation site name(s)**
Public Health	Program Teams	• Healthy Babies Healthy Children Program has two teams • Chronic Disease Program two has three teams	• HBHC Team 1 • HBHC Team 2 • CD Team 1 • CD Team 2 • CD Team 3
	Offices	• Three offices spread across three geographic areas: Markham, Richmond Hill, Vaughn	• Markham • Richmond Hill • Vaughan
Primary Care	Nurse-practitioner led clinic	• A small clinic with nurses and nurse practitioners providing primary care	• Clinic name
Hospital Care	Acute Care	• Three units Hospital A: 3C Medical, 4B Surgical, 2E Critical Care Unit • 1 units in Hospital B: 6C Medical-Surgical	• Hospital A 3C Medical • Hospital A 4B Surgical • Hospital A 2E Critical Care Unit • Hospital B 6C Medical-Surgical
Home Care	Offices	• Three offices spread across three geographic areas: Markham, Richmond Hill, Vaughn	• Markham • Richmond Hill • Vaughan
Long-Term Care	Homes	• Two Homes: Sunny Meadow and Carlisle	• Sunny Meadow • Carlisle
Long-Term Care	Homes	• Three Resident Care Areas: 2N, 3N, 4N	• 2N • 3N • 4N

The identification and selection of BPSO implementation site(s) for NQuIRE is important for many reasons. First, by creating individual implementation sites in NQuIRE, BPG implementation can be measured as roll-out occurs across the organization, which then gives the ability to compare outcomes across sites within an organization (e.g. all medical units vs. all units). Second, for some organizations this will be essential in being able to evaluate the effects of a BPG in individual clinical areas as well as within the organization as a whole. In the near future, this will also provide the ability for organizations to compare like BPSO implementation sites across BPSOs using the comparative reports feature.

A single BPSO implementation site within an organization only needs to be registered once in NQuIRE and NQuIRE indicators for all BPGs can be captured under a single implementation

profile in NQuIRE. The advantage of this is that dashboards can incorporate indicators from all BPGs, which are being implemented in a single implementation site. This enables organizations to identify the impact of multiple BPGs in a single BPSO implementation site. As well BPSOs can examine BPG indicator overlay reports, which allow two indicators to be presented on the same graph for a single BPSO implementation site in order to look at potential visual associations that are clinically relevant (e.g. process and outcome indicators from a BPG).

Example 1 below is a BPSO implementation site selection scenario to guide BPSOs in this process.

Example 1: BPSO Implementation Site Selection and Registration Scenario

BPSO Implementation Site Selection and Registration Scenario

A large acute care hospital has decided to implement the Diabetic Foot Ulcer BPG across the organization; however they first plan to initiate implementation in three medical-surgical units for one year, and then spread the implementation across the hospital the next year. They plan to initiate BPG implementation in 12 units across the organization over the course of two years.

Option A) The hospital registers three BPSO implementation sites representing each of the medical-surgical units where the DFU BPG is being implemented within three months, which provides enough time to collect pre-implementation data. As the hospital spreads the implementation they begin to register the remaining nine BPSO implementation sites to report to NQuIRE and also collect pre-implementation data for the remaining nine units.

Option B) The hospital registers all units where the BPG will be implemented at the beginning as they want to collect pre-implementation data for all 12 units from the beginning of BPG implementation. Therefore, the hospital will have 12 BPSO implementation sites in NQuIRE from the start.

Tip: Always start small and refine data collection processes prior to increasing the number of BPSO Implementation sites submitting data to NQuIRE. The important factor is quality not quantity.

2.5.2 Types of NQuIRE Indicators

NQuIRE collects data for three types of indicators, which include human resource (HR) - specific structure indicators, process indicators, and outcome indicators (see Figure 3). All sets of indicators can be found in Data Dictionaries on the NQuIRE website. HR structure indicators are not specific to any particular BPG and the same set of indicators is applicable to all BPSOs, and is collected from BPG implementation sites. Often these data are housed within the human resources, payroll, or finance departments of BPSOs. Process and outcome indicators are clinical BPG-specific where process indicators reflect the practice recommendations and the outcome indicators reflect overall effects of interventions recommended in the BPG.

Figure 4 outlines characteristics of the types of indicators collected in NQuIRE which are based on the Donabedian model of structure, process, and outcome indicators (Donabedian, 1966). It is important to consider all three types of indicators in evaluating BPG implementation. Human resources structure indicators provide context around the human resource factors, which may impact BPG implementation, which in turn can impact both process and outcome indicator data. Process indicators represent the actual practice recommendations that are being implemented, which can impact the outcome indicators specific to a BPG. Outcome indicator data can inform whether BPG implementation is having the intended impact or whether more focus needs to be paid to further enhance BPG implementation or to address human resources related factors. Hence, all three types of indicators are important to collect in NQuIRE to be able to describe a trend observed about BPG implementation and its impact.

Figure 4: Types of NQuIRE Indicators

Structure Indicators	Process Indicators	Outcome Indicators
Attributes of the organization or setting in which care occurs	*What is done to, for, and with clients in the process of providing care*	*The effect of care on the health status of clients*
• Not BPG-specific indicators • Structure (Human Resources) Data Dictionary	• Indicators specific to practice recommendations in a clinical BPG • Clinical BPG-specific Data Dictionaries	• Indicators reflect overall BPG-specific outcomes • Clinical BPG-specific Data Dictionaries

2.5.3 Anatomy of a NQuIRE Data Dictionary

Knowing how to read a data dictionary is an important step in planning for data collection and evaluation of BPG implementation. At first glance it may seem like a tedious task to look at each indicator individually, however understanding the data dictionary upfront will help with data analysis and interpretation.

NQuIRE Data dictionaries are available on the NQuIRE website and when published or revised a notice will appear on the home page. Data dictionaries are updated on an as needed basis, revised when BPGs are revised, and developed for new BPGs. In the near future, the NQuIRE data system will maintain all versions of indicators developed since 2012 for those guidelines that have been revised in new editions and may have updated indicators. BPSOs will be able to choose the indicators corresponding to the edition of the guideline they are implementing. For example, NQuIRE will have available for the guideline on Assessment and Management of Diabetic Foot Ulcers, the indicator amfoot_pro01_2005 for the original edition of the guideline and amfoot_ pro01_2013 for the guideline published in 2013. When a guideline is revised and a new edition is published according to the most recent evidence available, there is the potential for indicators to change or require revision as well. Hence, in order to ensure the link between

practice recommendations and the indicators in NQuIRE, BPSOs can only select indicators corresponding to the correct edition of the BPG being implemented for a cohort cycle.

The following steps will guide through the anatomy of a data dictionary:

- **Steps 1 & 2 (see Figure 5):** Ensure a match between the BPG being implemented and the BPG version (year) identified in the data dictionary. Ensure the most up-to-date version of the data dictionary has been sourced from the NQuIRE website. *With every 5-year BPG revisio*n, there is an opportunity for new evidence to impact the practice recommendations, which in turn may result in changes to the process indicators. As well, new evidence can impact the parameters set around outcome indicators, which are really important to know when measuring the effects of BPG implementation.

Figure 5: Anatomy of Data Dictionary Step 1 & 2
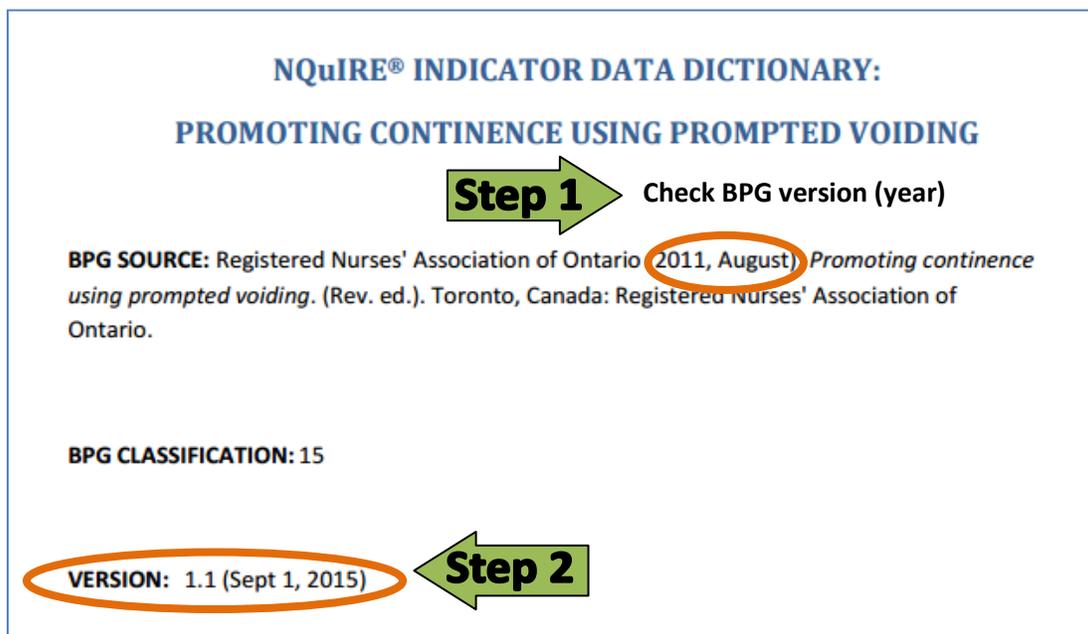
- **Step 3 (see Figure 6):** More recently, newly published BPGs have included an algorithm to illustrate how recommendations can be implemented in the care pathway which is then included in the data dictionary to assist BPSOs to visualize when and where data collection occurs for an indicator along the care pathway. An example of a measurement algorithm from the prevention of constipation BPG data dictionary is provided in Figure 5.

Figure 6: Anatomy of Data Dictionary Step 3

Prevention of Constipation Measurement Algorithm

Check for measurement algorithm ← **Step 3**

- Client with constipation
- Assessment •7 day bowel record/diary (Pro01)
  - Toilet consistently
  - Increase fluid intake (1500-2000 m l/day) → Increase fibre intake (21-25 grams/day)
  - Maximize physical activity
- Pharmacological treatment of constipation (Out 01)
- Quality of Life (Out02)

Individualized Constipation Protocol (Pro02)
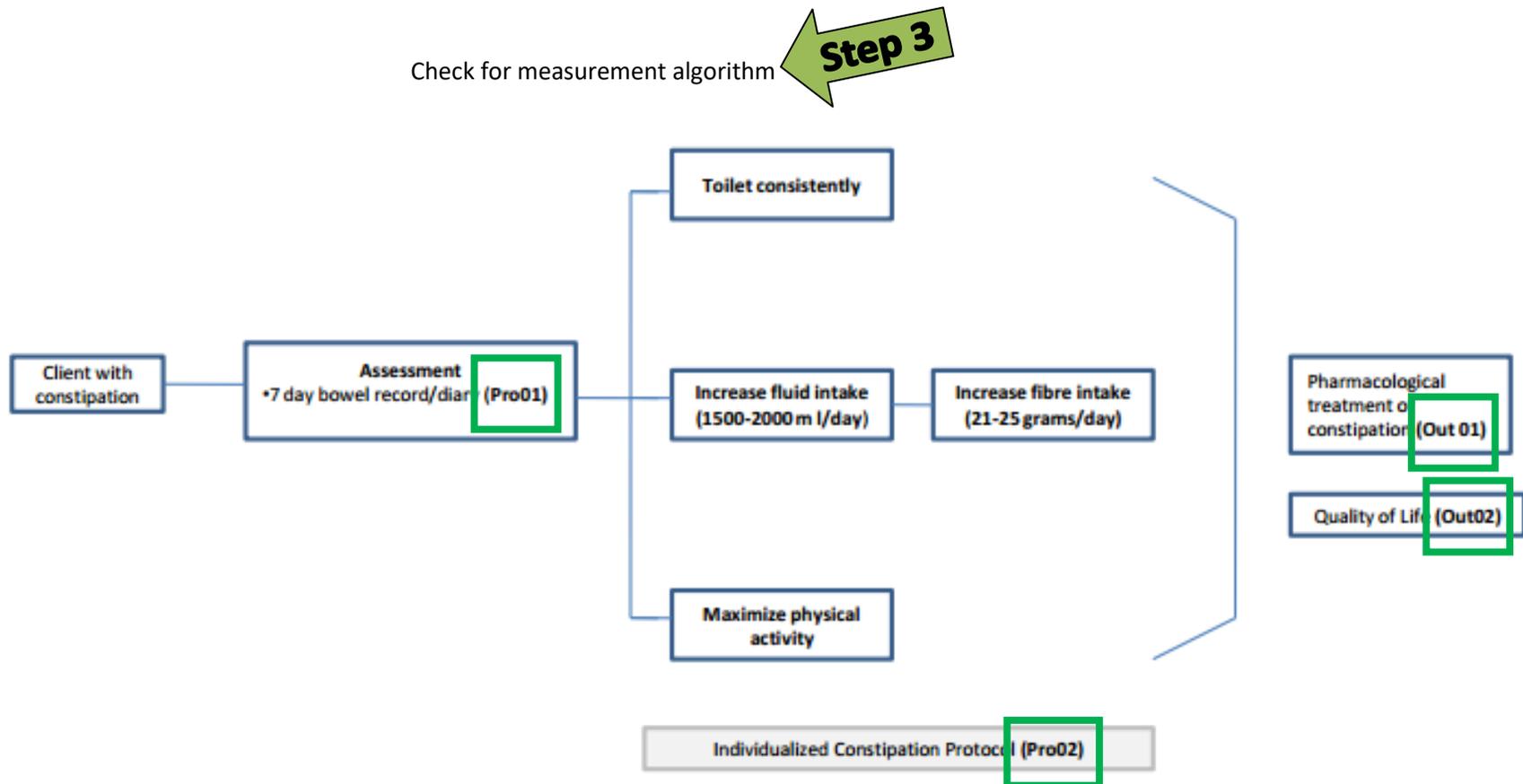
- **Step 4 (see Figure 7):** Check the history of changes to the indicators which is important to review when an updated version is made available as it may or may not impact data collection. In the case that a BPSO is implementing a newly revised (new edition) BPG then as per the BPSO policy, BPSOs must select indicators for this current version of the BPG. For each change in indicator, the update will be described along with possible implications for BPSOs. An example of a history of changes is provided in Figure 6.

Figure 7: Anatomy of Data Dictionary Step 4

HISTORY OF CHANGES TO THE NQuIRE® DATA DICTIONARY: ASSESSMENT AND MANAGEMENT OF FOOT ULCERS FOR PEOPLE WITH DIABETES

Version	Date	Indicator ID	Name	Update	Implications for BPSO
1.0	Sept 1, 2012			NEW DICTIONARY	
2.0	Nov 25, 2013	All indicators		Common Definitions, Rationale, Recommendations and References updated to reflect new edition of BPG (RNAO, 2013)	For reference
		amfoot_out01	Foot ulcer, healing	Numerator: healing rate changed	**Review. Change to data collection processes may be required.**
		amfoot_out02	Foot ulcer, closed	Healing rate and population changed (Count the # of foot ulcers, not patients)	**Review. Change to data collection processes may be required.**
		amfoot_out03	Offloading (pressure relief)	NEW INDICATOR	For reference

- **Step 5 (Figure 8):** Check the indicators table for a list of BPG-specific process and outcome indicators in respective order. Each indicator has an indicator ID which is used to identify the indicator in the data system. Use both the indicator ID and indicator name when communicating with the NQuIRE team.

Figure 8: Anatomy of Data Dictionary Step 5

INDICATORS:

ID	Indicator Name	Frequency of Data Collection
BPG 16 – Prevention of Constipation in the Older Adult Population		
constipation_pro01	Assessment, bowel record	Monthly
constipation_pro02	Intervention, individualized constipation protocol	Monthly
constipation_out01	Pharmacologic treatment of constipation	Monthly
constipation_out02	Quality of life	Monthly

(Step 5 arrow points to "Indicator Name" column)

- ***Step 6 (Figure 9):*** Review each indicator to determine which of the practice recommendations being implemented align with indicators available in the data dictionary and then review the operational definitions for those indicators. The operational definition is derived from the practice recommendations and tells how to measure the implementation of the practice recommendations. In the example above (see Figure 8), a process indicator for the Screening for Delirium, Dementia and Depression in older adults BPG (2010) has been provided to explain the link between the practice recommendation and the process indicator. To reiterate, the process indicator measures what the provider is doing to, for, or with the person.

Figure 9: Anatomy of Data Dictionary Step 6

INDICATOR ID	TYPE	TITLE OF INDICATOR
dddscreen_pro01	Process	Assessment, baseline cognitive function

(Step 6 arrow points to "Process")

BPG RECOMMENDATION:

1.0 Nurses should maintain a high index of suspicion for delirium, dementia and depression in the older adult.

2.0 Nurses screen clients for changes in cognition, function, behaviour, and/or mood based on their ongoing observations of the client and/or concerns expressed by the client, family and/or interdisciplinary team including other specialty physicians.

OPERATIONAL DEFINITION:

Percentage of patients 65 years and older screened for cognitive, functional, behavioural and mood disorders on initial assessment using a standardized tool

(Speech bubble: To reiterate, the process indicator measures what the provider is doing to, for, or with the person)

An operational definition extracts key components of the practice recommendations which are;

    I.   Target population (blue circle in Figure 9)
   II.   Clinical condition (green circle in Figure 9)
  III.   Intervention/action of the nurse/provider (orange circle in Figure 9)
  IV.   Timing of when the intervention/action is carried out (red square in Figure 9)
   V.   Standardized tool/method being used to carry out the intervention/action (blue square in Figure 9)
  VI.   Indicator being calculated as a percentage or rate (purple square in Figure 9)

Both the target population and the clinical condition are determined by the BPG as a whole and are important in identifying the data that will be collected. The intervention/action is directly extracted from the practice recommendation(s). The timing of when the intervention/action is carried out can be broadly identified in the practice recommendations and thus a more specific time interval is provided in the operational definition to ensure all BPSOs collect the information in a consistent manner. If in the discussion of evidence of the practice recommendation, standardized tools/methods are indicated then the indicator will also include these tools/methods. Finally, depending on the goal of the indicator a percentage or rate is calculated.

In order to create an effective evaluation plan and use the data dictionaries, the link between the practice recommendations and the process indicators needs to be well understood. By making a clear link, the process indicators will measure the effects of the implementation of the BPG-practice recommendations on overall practice change.

- **Step 7 (Table 6)**: Review the following sections of the data dictionary in order to identify target population for data collection as well as determine what data to collect and how to collect the data.

Table 6: Anatomy of Data Dictionary Step 7

Title of section	Description
Rationale for indicator	Directly sourced from BPG
Improvement noted as	Direction of improvement
Numerator	Subset of the population captured in the numerator. The required data elements (variables) that need to be collected are described.
Denominator	The target population for a specific indicator linked to the practice recommendation(s) being implemented. The required data elements (variables) that need to be collected are described.
Inclusions/Exclusions	Describes who and what to include/exclude from data collection
Data reported as	Calculation for indicator using numerator and denominator
Risk adjustment factors/stratification	Identifies how the data will be categorized for analysis Stratification refers to the categorization or classification of data in order conduct analysis which is specific to that category
Data source	Identifies common data sources where the data for the indicator can

Title of section	Description
	be extracted (e.g. electronic health record, payroll data source, incident reporting systems, administrative data sources, etc.)
Special notes	Further details on compliance with indicator from BPG
Frequency of data collection	All indicators are collected monthly and reported quarterly

2.5.4 Human Resources Structure Indicators

Human resources (HR) structure indicators are independent of the BPGs and intend to capture nursing workload and intensity measures such as nursing hours per patient days, turnover, absenteeism, level of education, etc. BPSOs can begin to identify and collect HR structure indicators since those are not BPG specific. It is a good idea to work with the HR office, payroll or admin office early to identify the indicators that can be submitted to NQuIRE. This can be done after the implementation sites have been selected. Review the HR structure indicators data dictionary to identify which indicators are feasible and most useful for the evaluation of BPG implementation.

Again, the HR structure indicator data should pertain to the BPG implementation sites registered in NQuIRE in order to be able to capture structure, process and outcome data for all implementation sites in NQuIRE and support BPSOs in determining associations among structure, process and outcome indicators.

2.5.5 Process & Outcome Indicators Selection Process

Following the review of the Anatomy of a Data Dictionary section 2.5.3, the indicator selection process takes place. This step is integral to ensuring quality data and accurately monitoring and evaluating BPG implementation as a BPSO. This section will support BPSOs to create a structured process for selecting indicators for NQuIRE. This involves the following considerations for selecting BPG-specific process and outcome indicators:

- First, identify the BPGs to implement or have already implemented. Then, determine which of the BPGs will be focused for evaluation using NQuIRE. As per the BPSO agreement, BPSOs are required to meet minimal reporting requirements for NQuIRE. It is recommended to evaluate all BPGs using NQuIRE; by starting small and then gradually expanding participation in NQuIRE to all BPGs.
- Second, indicator selection may be dependent on whether documentation is electronic, paper, or both. This will determine the methods needed to extract data elements for a specific indicator and whether it is feasible in the context of the BPSO's setting.
- Third, consider the organization's priority in measurement and evaluation (e.g. in Ontario, health-care organizations are expected to submit quality improvement plans [QIPs] to Health Quality Ontario, an arms-length advisor on health-care quality for the government of Ontario). As well, reporting requirements for other government organizations which align with NQuIRE indicators should also be explored. This is an opportunity to leverage existing data collection processes, if applicable. When deciding

to select indicators that align with other reporting requirements, it is pertinent to ensure that operational definitions, inclusion/ exclusion criteria, data elements, etc. all match with the NQuIRE data dictionary to ensure the integrity of the data being submitted to NQuIRE. This can also be an opportunity for an organization to further standardize its data collection for an indicator, for multiple purposes.

- Fourth, in order to select process and outcome indicators, identify which practice recommendations are being implemented for each BPG and select indicators that align with these recommendations. To facilitate this alignment process, the recommendations from which the indicators are developed are also listed in the data dictionary. It is recommended that IT/decision support as well as both BPSO leads and BPG leads are all involved in this process.
- Fifth, note the practice recommendations being implemented organization-wide versus a specific clinical area to determine the feasibility of establishing indicator data collection processes.

To assist with indicator selection, a template has been provided for reference in Appendix B. Example 2 below describes an indicator selection scenario to guide BPSOs.

Example 2: Indicator Selection Scenario

An acute care hospital has implemented the Risk Assessment & Prevention of Pressure Ulcers BPG (Revised 2011). After a thorough gap analysis, the BPG Implementation team identifies that they would like to focus their implementation on two specific practice recommendations; 3.5 & 3.6 (see recommendations below).

3.5	Clients at risk of developing a pressure ulcer should not remain on a standard mattress. A replacement mattress with low interface pressure, such as high-density foam, should be used.	Ia
3.6	For high risk clients experiencing surgical intervention, the use of pressure-relieving surfaces intraoperatively should be considered.	Ia

The BPG implementation team has a good idea of how to implement the practice recommendations and is now ready to plan for evaluation prior to initiating any practice change. After reviewing the data dictionary (and the associated recommendations that are also stated in the dictionary), the team identifies potential indicators of interest.

```
                    Practice Recommendations: #3.5 & 3.6

    Process indicator:        Outcome indicator:        Outcome indicator:
    ulcerprev_pro03           ulcerprev_out01           ulcerprev_out02
```
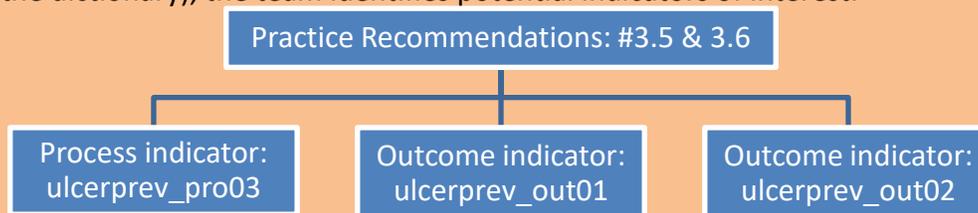
The team identifies three indicators out of the five listed in the data dictionary which align with the selected practice recommendations (see hierarchical chart above). At this point the team needs to do a thorough review of the three indicators and determine how the data elements can be collected i.e. data on target groups or subsets, and identify data sources,

implementation sites, etc.

After a thorough review of internal processes and data sources and the three indicators identified, the BPG implementation team concludes whether or not it is possible to collect all three indicators, and starts working on standardizing processes needed to collect the data for NQuIRE.

2.6 Plan for Data Processing

The plan for data processing should include how the data will be extracted whether from an electronic health record or paper-based charts, include standards around transcribing the data once extracted, reviewing data for errors or missing data points in order to validate the date prior to submitting data to NQuIRE. For example, if a BPSO implementation site user is submitting data to NQuIRE, the BPSO lead may want to validate the data by reviewing it prior to submission. The final part is planning for submission of data to NQuIRE which includes who will submit the data, when the data will be submitted (i.e. incorporate the data submission schedule into the plan), and the method that will be used to submit the data (i.e. online web form or import template). It is also important to document the data process plan so that everyone involved with data processing follows a standardized process. This is also an opportunity to gather the data about the data (i.e. metadata) and the context of the BPSO's data. Here, the BPSO's clinical informatics, decisions support and IT members, along with the BPG co-leads will be pertinent to planning for data processing.

2.7 Plan for Data Analysis

The plan for data analysis should include how the data will be analyzed and in what context, along with who will be involved with analysis and interpretation. This is an opportunity to also discuss potential limitations of the data and the type of conclusions that can be drawn from the data. The BPSO should plan for how the NQuIRE reports and dashboards will be utilized and interpreted for BPSO reports shared with RNAO and internally within the BPSO.

2.8 Plan for Data Sharing

The plan for data sharing should include how the NQuIRE data, captured in the auto-generated reports and dashboards will be shared, and who is responsible for sharing the data with team members, and how often the data will be shared with others. This plan should also include how the NQuIRE reports and dashboards will be incorporated into the BPSO reports to RNAO. At this stage, also consider how, when and where the NQuIRE reports can be shared internally (i.e. frontline staff meetings, conferences, manuscripts, presentations, senior management meetings, etc.). This process once developed should be documented so that it can be shared with all stakeholders.

3.0 CREATE DATA FOR NQuIRE

Data Life Cycle

Plan → Process → Preserve

Create → Analyze → Share & Re-use

Metadata & Documentation; Manage Quality; Backup & Restore
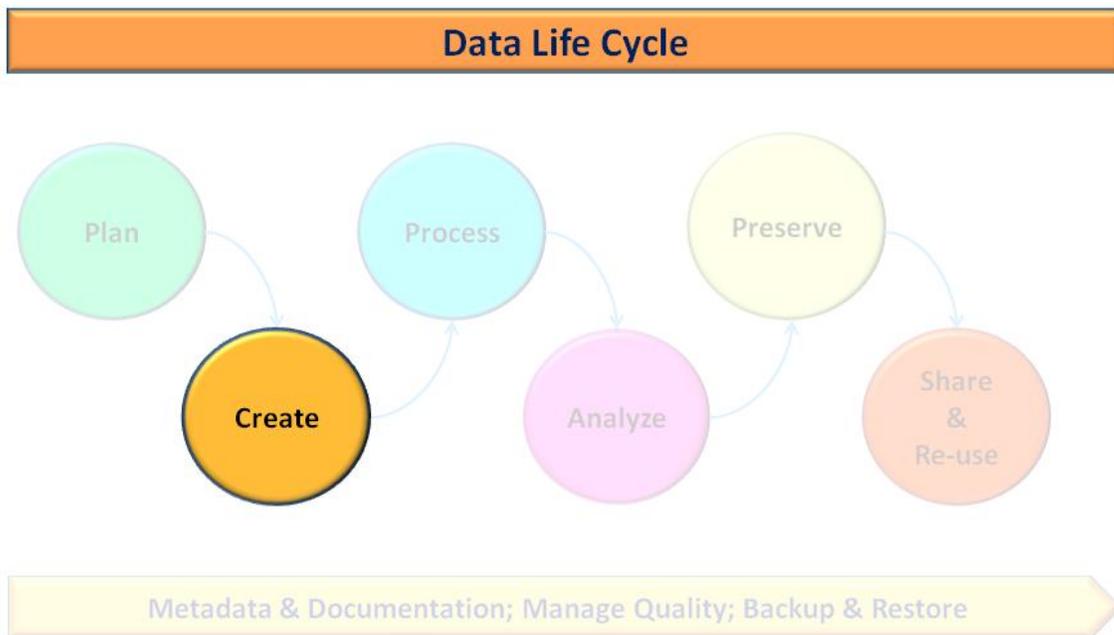
In most health-care settings, the data that are collected for the purpose of documentation are both quantitative and qualitative in nature, in addition to being both objective and subjective (i.e. requiring clinical judgment). Many organizations are at varying stages of electronic health record implementation which adds to the challenge of data collection and extraction. There may be multiple data sources from which data can be collected with the potential for duplication in documentation. Therefore, a comprehensive plan for evaluation, which includes a standardized process for data collection, is integral to ensuring the quality of the data being submitted to NQuIRE.

3.1 Data Collection: Pre-implementation data

Pre-implementation data are also referred to as baseline data. These data are pertinent in establishing a comprehensive evaluation plan and serves as a point of reference for monitoring and evaluation. A reference point enables one to see the effects of a practice change over time and highlights, which performance measures are affected by the practice change and implementation of a BPG practice recommendation.

Pre-implementation data provide further information to assist in the interpretation of data in NQuIRE. Collecting pre-implementation data requires pre-planning and will help identify any data quality challenges, which are commonly seen when BPSOs first start submitting data to NQuIRE. By incorporating pre-implementation data into evaluation planning, it also provides an opportunity to troubleshoot the indicators and standardize data collection processes and

documentation prior to having the data influenced by the BPG implementation. Use the annotation option to indicate submission of pre-implementation data in NQuIRE.

Figure 8 shown below provides BPSOs with an opportunity to identify when in the BPG implementation process pre-implementation data can be incorporated into the data creation plan. In all instances of BPG implementation there is an opportunity to collect pre-implementation data. The most obvious is when a new BPG is to be implemented. However, even with previously implemented BPGs, pre-implementation data can be collected for the following three scenarios; (i) revamping the implementation of a BPG, (ii) spreading the BPG to new implementation sites within the organization, and (iii) a new revision of the BPG is available for implementation.

Figure 10: When to Collect Pre-Implementation Data
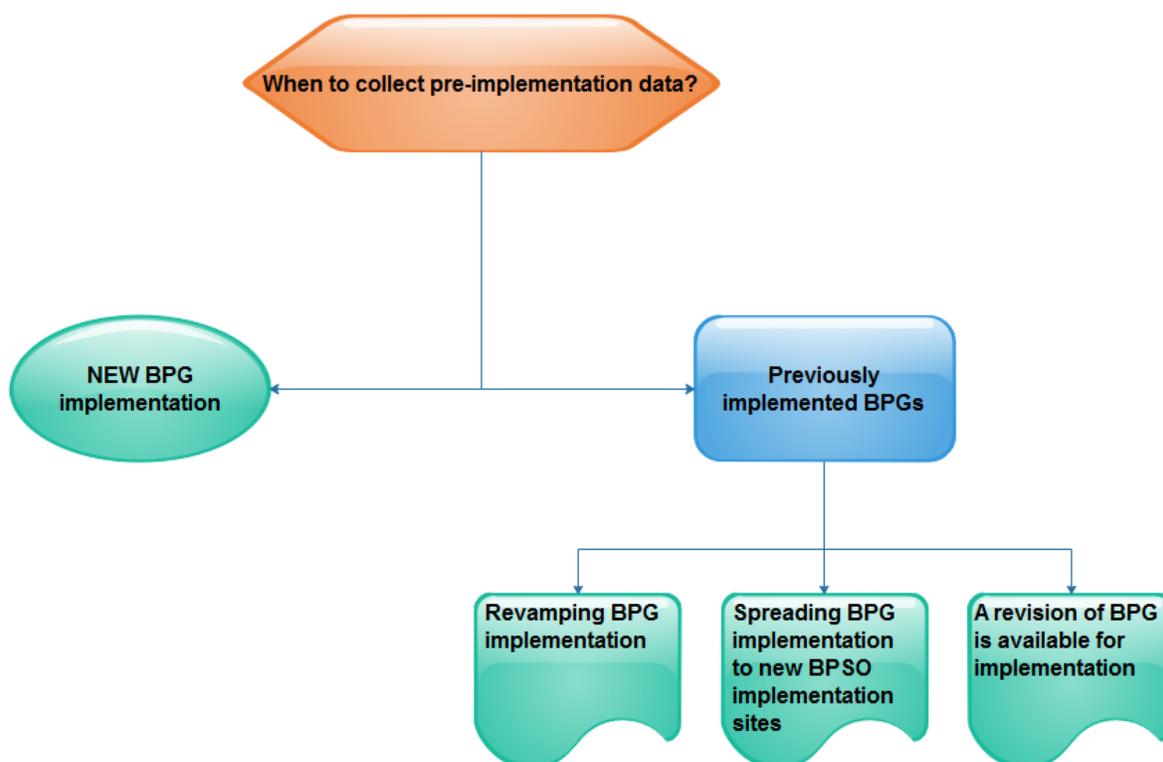
The quality of data being submitted to NQuIRE is enhanced when the BPSO becomes proficient with utilizing NQuIRE and have the opportunity to familiarize with the system (through the demo and live sites), the indicators, and learn to troubleshoot early on. In addition, most organizations are familiar with looking at patient- or client- specific data; however, it is important to understand the differences between a patient-level data system and the NQuIRE data system which is a ward/unit-level data system (i.e. a randomized sample or all clients/patients in a unit/ward/program aggregated to represent that unit/ward/program). Thus collecting pre-implementation data can support your proficiency using NQuIRE. The purpose of NQuIRE is to support the evaluation of BPG implementation and see a change/improvement in data over the course of implementation and sustainability work.

3.2 Data sources

When beginning to look for data sources for NQuIRE, BPSOs may feel overwhelmed with the many sources that exist within their organization or may not even know where to start. This section of the guide will support BPSOs in determining the right questions to ask and to discover the right people that should be part of the NQuIRE support team. Table 7 outlines the types of data sources which exist in the health-care system, and the types of indicator data which can be found within each data source.

Table 7: Types of Data Sources in Health Care

Data sources	Description	Examples	Indicator Type(s)
Internal Administrative Databases	These databases have human resources, payroll, financial data, etc. These data can be centralized or in many separate databases in an organization. Ask HR, payroll, and finance staff to help source these data.	Human Resources Information Systems (HRIS) can house HR, payroll, and finance data.	Structure
Electronic Health Records	This is where patient/client data are stored and depending on the organization there may be a single system or specialized systems for specific clinical settings. These data sources generally replace paper documentation or are used in conjunction with paper charting	There are various vendors which organizations use to house their patient/client data. Meditech, Cerner, PointClickCare, etc.	Process Outcome
Incident reporting databases	This is an internal system which is used to house incidents and near misses for falls, wounds, medication errors, etc.	National System for Incident Reporting (NSIR), in-house systems	Outcome
Paper documentation	This can be a paper chart, specific assessment tools on paper, nursing care plan, or kardex	Chart, Clinical note, Assessment tool, Discharge checklist, Kardex, etc.	Process Outcome
Audit	Verification and/or examination of health records for specific information	Manual chart audits or clinical audit can be documented using a paper or electronic tool	Process Outcome
Patient Survey		Patient Experience Surveys required by	Process Outcome

Data sources	Description	Examples	Indicator Type(s)
		Accreditation Canada (NRC Picker)	
External Administrative Databases	These are data submitted to external organizations as part of an organization's reporting requirements	Canadian Institute for Health Information (CIHI): Discharge Abstract Database (DAD), etc.	Outcome

3.3 BPG-specific target population (Population of interest)

Once the potential data sources within the BPSO have been identified, the next step is to focus on the target population for actual data collection. Whether a BPSO is planning to look at all patients/clients for a specific BPG or a representative sample, the target population will need to be identified (refer to Figure 10 below). The identification of the target population is pertinent to ensuring data accurately reflect the patients/clients that are the focus of the BPG implementation, and that the correct data sources are accessed as well.

Figure 11: Identify Target Population

All patients/clients in BPSO

BPG-specific Population of interest and clinical areas/settings where BPG is being implemented

Target population-specific clinical area(s)/setting(s) where data is being collected for NQuIRE
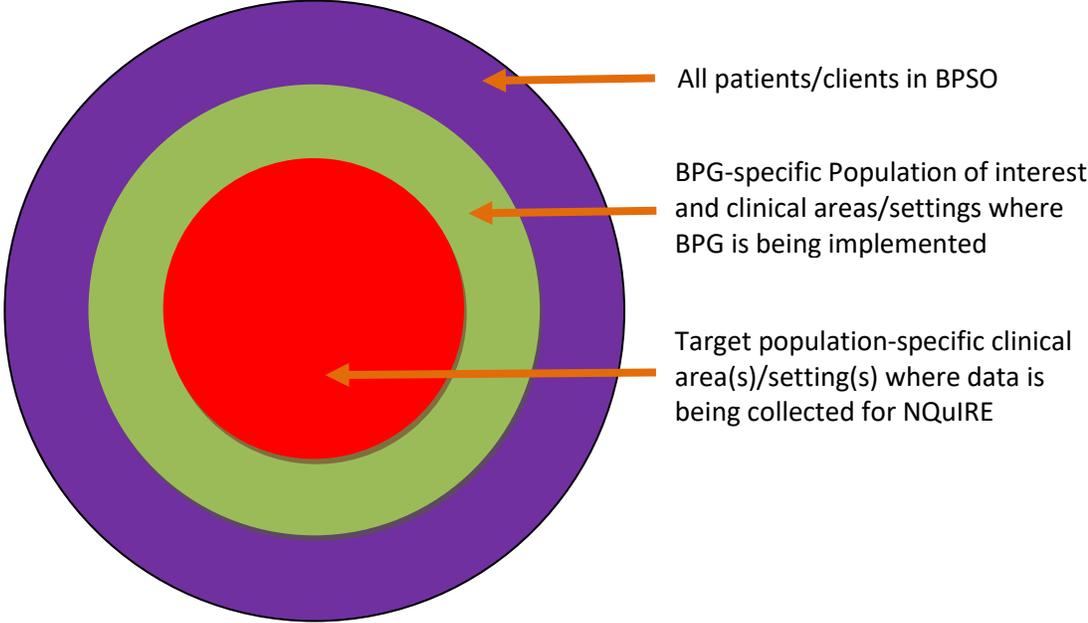
When determining the population of interest, a BPSO may decide to focus on a specific-subset of the target population due to the organizational priorities identified by organization leadership. Or perhaps the BPG is being implemented in a specific clinical area only initially and will be spread to other areas in the future. These types of considerations are important to identify in order to narrow down the population of interest for determining sample for data

collection. Regardless of implementation roll out schedule or where a BPSO currently is in the implementation process, it is important to go through the exercise of identifying the population of interest as outlined in Figure 11.

In order to support BPSOs in the identification of the target population, a blank template of Figure 11 has been included in Appendix C.

3.4 Sample Size & Sampling Methods

Once the target population for NQuIRE has been identified, it is time to determine whether all eligible patients/clients will be included in NQuIRE data or use a representative sample (i.e. *minimum* random sample of 20 per cent of the target population). If the organization has electronic health records, it will be expected that all eligible patients/clients are included in the dataset; however, when organizations are relying on paper documentation/charts or engaged in manual data extraction from a large number of clients'/patients' charts (within the measurement period, e.g., a month), then determining sampling from the target population may be the more practical method. In cases where sampling is required, it is important to be mindful of the various sampling methods and their implications on data.

There are two categories of sampling, probability and non-probability. Probability sampling is defined as a method of sampling based on randomization or chance whereas non-probability sampling is subjective and determined by those collecting the data based on a specific research question. In research, probability sampling is used for quantitative studies and non-probability sampling is used in qualitative studies. For the purposes of NQuIRE, the expectation is that BPSOs use probability sampling.

The minimum sampling requirements per BPSO Implementation Site is a **minimum "random" sample of 20 per cent** of the BPG-specific population of interest. However, where data are being captured electronically, the expectation is that BPSOs will submit aggregated data for 100 per cent of their target population. Small organizations are encouraged to provide data on their total target population in order to ensure data are representative of their target population. Therefore, if the total target population size is 50 or below, then it is recommended to include all patients/clients. Where manual data collection occurs, it is advised that the selected sampling method ensures statistical representation of the population of interest i.e. probability sampling.

3.5 Probability Sampling Methods

Probability sampling allows BPSOs to select a representative sample of their target population for BPG implementation. Table 8 below outlines the types of probability sampling methods BPSOs can select from (Statistics Canada, 2013).

Table 8: Probability Sampling Methods

Probability Sampling	Description	Example
Simple Random*	Each person has an equal chance of being selected in the sample	A long-term care home has implemented a BPG across the organization and selects a random sample of 100 residents out of 252 to submit aggregated data
Systematic	Also known as interval sampling, there is pre-determined gap between each selected unit in the sample. First determine the population size, then determine the sampling interval and then select a number between one and the sampling interval as the starting point for the sample. Then select the next number in the interval and so on.	A long-term care home has implemented a BPG across the organization and has 252 residents of which a sample of 50 is required. At random the interval is selected to be 5 and the first number selected is 2 between 1 and 5. The numbers in the sample are as follows; 2, 7, 12, 17,…247, 252
Stratified**	Stratify or group the population by a specific characteristic such as age, care setting, etc. These groups must be mutually exclusive known and then sample from each stratum	A hospital has implemented a BPG organization-wide. The 12 units in the hospital are divided by their unit type which are medical (5), surgical (5), and critical care (2). Using simple random sampling, clients/patients in selected units under each unit type or stratum are selected to collect data.
Cluster	Divide the population into groups or clusters and then randomly select a number of clusters to be included in the sample	A home care agency has 70 physical offices across the country and decides to randomly sample 20 sites
Multi-Stage	This is similar to cluster sampling where the first stage is to randomly select clusters. The second stage is to then select a sample from each cluster to include in the sample	A home care agency has 70 physical offices across the country and decides to randomly sample 20 sites and then from each site randomly select 100 clients.

*Note: Most BPSOs that are not submitting aggregated data from 100 per cent of their clients/patients undertake simple random sampling

**Note: This is recommended for sampling different unit types in an organization that has implemented a BPG organization wide. Sampling is conducted in keeping with the proportional distribution of the number of each unit type (e.g. intensive care, emergency, surgical units, etc) in the entire organization, so that the unit type with the largest proportion will have the most units in the stratified sample, the second largest unit type will have the second largest number of units, and the third largest proportion of unit type will have the third largest number of

units in that order. That is to say, a BPSO will have to determine the ratio of unit types (or strata) before conducting any random sampling of patients/clients within each sampled unit type or stratum.

3.5.1 Hospital Care Organization-wide Sampling Methods

For those BPSOs that have an organization-wide BPSO implementation site representing their whole hospital, there are key considerations in ensuring a representative sample of units/wards to be included as part of the target population for a hospital-wide implementation site in NQuIRE.

A stratified sampling method for the whole hospital will work best where the proportion of each unit-type (or stratum) is represented in the sample. For example, Sunny Meadow hospital has 10 medical units and 5 surgical units. The organization decides to randomly select a minimum sample from each unit-type by selecting at minimum 2 medical units and 1 surgical unit to reflect the 10:5 or 2:1 proportional distribution across the entire hospital. The hospital then collects data on all the patients (or a sample of the patients) in each of the selected units.

3.6 Non-Probability Sampling Methods

Non-probability sampling includes convenience, volunteer, judgment, and quota sampling methods. Non-probability sampling methods are not recommended for quantitative work where sample size represents the larger target population. This sampling approach is described below in Appendix D.

3.7 Differences between probability and non-probability sampling

Understanding probability and non-probability sampling will help determine what kind of sampling method to select, in addition to understanding how a type of sampling determines what can and cannot be done with the data. That said, Table 10 highlights the important differences between probability and non-probability sampling approaches and emphasizes why probability is the preferred method for quantitative studies.

Table 9: Probability versus Non-Probability Sampling

Probability Sampling	Non-Probability Sampling
Sample selected randomly with each client/patient having an equal chance of being selected	Sample is selected by subjectivity based on cheapest/easiest/quickest method
Eliminates bias	Cannot determine if the sample is adequate
Results are generalizable to the target population	Results are only generalizable to the sample
Can conduct statistical analysis and make statistical inferences	Cannot conduct statistical analysis, only exploratory research and cannot make statistical inferences
The sample estimates population characteristics	Sample does not estimate population characteristics
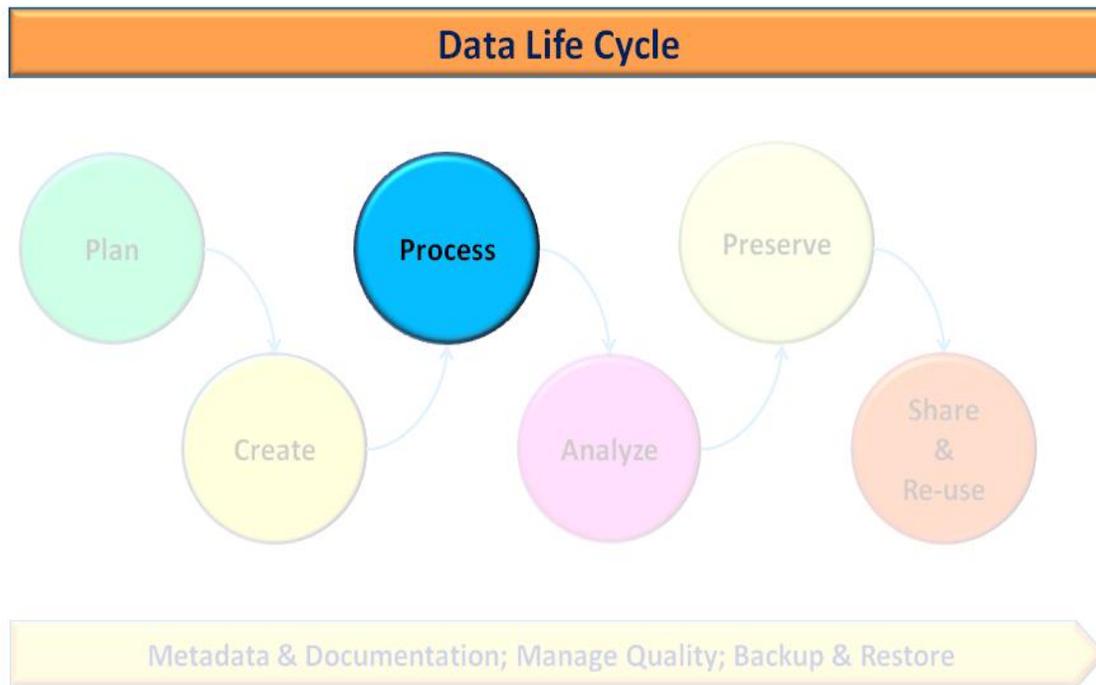
At this stage of the data life cycle, the data are extracted, transcribed, cleaned, validated, reviewed and submitted to NQuIRE. Depending on the BPSO, a team of IT/Decision support, data analysts, clinical experts, management, etc, may be required in this step. The context in which the data are being extracted from the electronic health record or paper chart is important to understand and capture (i.e. document). This type of historical documentation about the data will enable a way to review and understand the data in the future, and have the clinical context reflected. In this section, common types of errors which occur during the stage will be discussed along with the data review, the annotation feature, and considerations for submission to NQuIRE.

4.1 Types of errors

In order to identify and minimize errors, an understanding of the types of errors that can occur during data collection is important. Table 10 outlines four common types of errors; initial documentation, transcription, interpretation and programming (Bowman, 2013). Solutions for each of these types of errors include ensuring processes are in place for double-checking, standardization of documentation, eliminating duplication of documentation, appropriate personnel involved with data collection process, and ensuring efficient building of electronic health records. However, for each error there may be a number of solutions required in order to solve the issue.

<div align="center">**Table 10: Types of Data Collection Errors**</div>

Types of errors	Description
Initial documentation	*Initial documentation errors* are the most difficult to identify and prevent because they are dependent on the clinician documenting in the electronic record or paper chart. Often double-checking is dependent on those providing the nursing care at the time. Minimizing these errors through regular chart audits and ensuring documentation tools are up-to-date is vital. E.g. The nurse fails to document an injury following a fall in the incident reporting system.
Transcription	*Transcription errors* occur when someone is entering data from one data source to another. An example is entering information from a paper chart to an electronic record or from an electronic health record to the NQuIRE data system. Although human error is a reality, it can be minimized if review and double checking is done of the entries prior to submitting data to NQuIRE. E.g. The paper chart is difficult to read and the clerk enters a stage I pressure injury as a stage II pressure injury in the electronic database for tracking stages II-IV pressure injuries.
Interpretation	*Interpretation errors* are dependent on the individual interpreting the data and their level of knowledge of the data that are being collected. This can occur during transcription or extraction of data for aggregation. All staff involved in data collection should be educated in the appropriate interpretation of the data for the clinical context. E.g. A clerk is asked to extract data on pressure injuries and the clerk includes stage I pressure injuries in the database tracking stages II-IV pressure injuries.
Programming	*Programming errors* occur with electronic data systems which result in incomplete or incorrect data being extracted for NQuIRE. This type of error can only be identified by the organization and with an in-depth review of data. A review of data sources and the identification of duplicated documentation can provide insight into these types of errors. E.g. An issue of double-counting: Decision support is asked to extract falls data from a specific screen and the screen comes up in multiple places, which results in the same patient being counted more than once for a fall.

4.2 Missing data submissions

BPSOs are expected to submit data for selected indicators consistently for all implementation sites reporting data for an indicator. Missing submissions are indicated in NQuIRE by "not reported" or "no submissions" in the reports which may be due to many reasons (i.e. unable to

access the data for a specific month, a BPSO lead user to BPSO implementation site user is on vacation, etc.). If possible, there is always the opportunity to go back and fill in the missing submissions and BPSOs are encouraged to do so. In order to ensure data quality, the NQuIRE team will follow-up with BPSOs regarding missing submissions in NQuIRE.

4.3 Data Review

As part of quality control, it is vital to establish data review procedures to check for adherence to standardization of data collection processes and ensure both the prevention of poor quality data entering the system and missing data. There are two important periods where a BPSO internal data review is needed: (1) prior to submitting data to NQuIRE, and (2) after receiving the released NQuIRE reports.

BPSOs should conduct an internal review of the data prior to submitting to NQuIRE as a key step in ensuring high quality data are being submitted. The BPSO lead user should contact the NQuIRE team immediately if there is any error in the submitted data so that the error can be corrected.

When establishing data collection processes within the organization, consider how and when an internal data review will be incorporated into the plan. Remember the NQuIRE reports will only be as good as the data submitted, and so without having a process of double-checking the data and ensuring it captures what has been intended, the NQuIRE reports will not be useful. The long-run benefits of creating processes to prevent poor quality data from entering the system far out-weigh the initial cost (in terms of time needed) to establish such processes. The reason for this is that, in the absence of an established internal quality control check, it may be time consuming to identify and correct an error that may have appeared in an NQuIRE report.

4.4 How to utilize the annotation feature?

The purpose of the annotation feature is to enable BPSOs to provide clinical and organizational context to their data. This is a meaningful way to capture contextual facts around the data that are reported to the NQuIRE data system.

The listed annotation options in Figure 10 below are available for every submission of indicators for a specific BPG. The annotation provided will represent all the data the BPSO is reporting for a single submission. If the annotation is specific to a single indicator, it is important to include that information in the details.

Figure 12: Annotation Options

Selecting the annotation option will enable others to better understand and interpret why deviations in the data or trends or shift in the mean for the graph occurred. Without annotations, it is difficult for others to understand, explain or interpret the data in the right context, especially retrospectively. Table 11 below describes the available annotation options and when and how to make the best use of them.

Table 11: When and how to use Annotation Options in NQuIRE

Annotation Option	When and how to use?
Start of BPG Implementation	When a BPG implementation began. Note: it is recommended to indicate the months and year when implementation began.
Change in Practice	Include practice changes introduced as part of BPG implementation. BPSOs may implement practice recommendations sequentially after the start of BPG implementation and this annotation can assist in capturing the sequence.
Baseline End	This is the last month of pre-implementation data that works as the baseline or reference point to identify whether the BPG implementation is having an effect on practice or patients/clients/residents
Change in Staffing	When significant staffing changes occur they can impact BPG implementation, and therefore, it is important to note this as an annotation. Examples are change in nurse to patient ratios, strike, layoffs, change in management and policies that affect staffing and work flow, etc.

Annotation Option	When and how to use?
Data Collection Processes	Indicate challenges with data collection that may impact the data or indicate a change in the data collection process. It is important to note these changes in NQuIRE because they impact analysis and interpretation. Examples are switching from sampling to collecting data from all patients using an electronic health record, using a new standardized data collection tool, changes in data extraction methods, etc.
Indicator Exceptions	Specify any indicator deviations from what is defined in the data dictionary. Provide details related to the exceptions for data quality and considerations for comparability. This may include modifications in an indicator to support the use of the indicators in a particular context or unique application of the BPG. Examples include changes to inclusion/exclusion criteria and to any data elements.
Other	Free text annotation that enables BPSOs to capture annotations other than the pre-determined list above

4.5 NQuIRE Data Submission Process

In order to submit data to NQuIRE, BPSOs need to be aware of the data submission schedule along with the types of reporting methods available to submit data for NQuIRE.

4.5.1 NQuIRE Data Submission Schedule

The NQuIRE data submission schedule outlined in Table 12 runs on the calendar year as there are BPSOs from many different countries participating in NQuIRE and therefore the fiscal year or any other reporting deadlines were not possible.

Table 12: Data Submission Schedule

| Reporting Period	Reporting Dates	Last Day to Enter Data
Q1	January, February, March	May 15
Q2	April, May, June	August 15
Q3	July, August, September	November 15
Q4	October, November, December	February 15, following year

4.5.2 Reporting Methods

There are two options when submitting data for NQuIRE: (i) the online web form or (ii) the excel data import template. Please refer to the *NQuIRE User Manual* for detailed instructions. Table 13 below outlines the advantages and disadvantages of both methods to aid organizations in selecting the method that will work best in their setting.

Table 13: Advantages and Disadvantages for NQuIRE Data Submission Methods

	Online Web form	Data Import Template
Advantages	1. **Intuitive** (complete page by page) 2. **Quick** if submitting data for only a few indicators, few implementation sites or for only one month 3. **Visually** they can see the auto-calculated indicator right away 4. **Error-checking** for required fields and correct data format	1. **Easily** submit larger amounts of data 2. **Allows** multiple personnel involved with data submission (and even share on a common internal share drive) 3. **Re-use** previous form and update with new data 4. **One place** to keep all the data for NQuIRE 5. **Automate** data collection (can use excel functionality to pull data from other spreadsheets) 6. **Review** of the data by NQuIRE lead user for quality prior to submission 7. **Time-saver** once familiar with process
Disadvantages	1. **Time consuming** especially if there are many indicators and many implementation sites to submit data 2. **Tedious** when submitting large amounts of data 3. **Start again**: each month must be submitted separately on a separate form and no data are carried over month-to-month	1. **Multiple** personnel involved with data 2. **Learning** curve in using the template 3. **Resources** and time needed to setup the process initially 4. **Upload** new template every time an indicator is added or NQuIRE makes changes to the indicators.

5.0 ANALYZE NQuIRE DATA
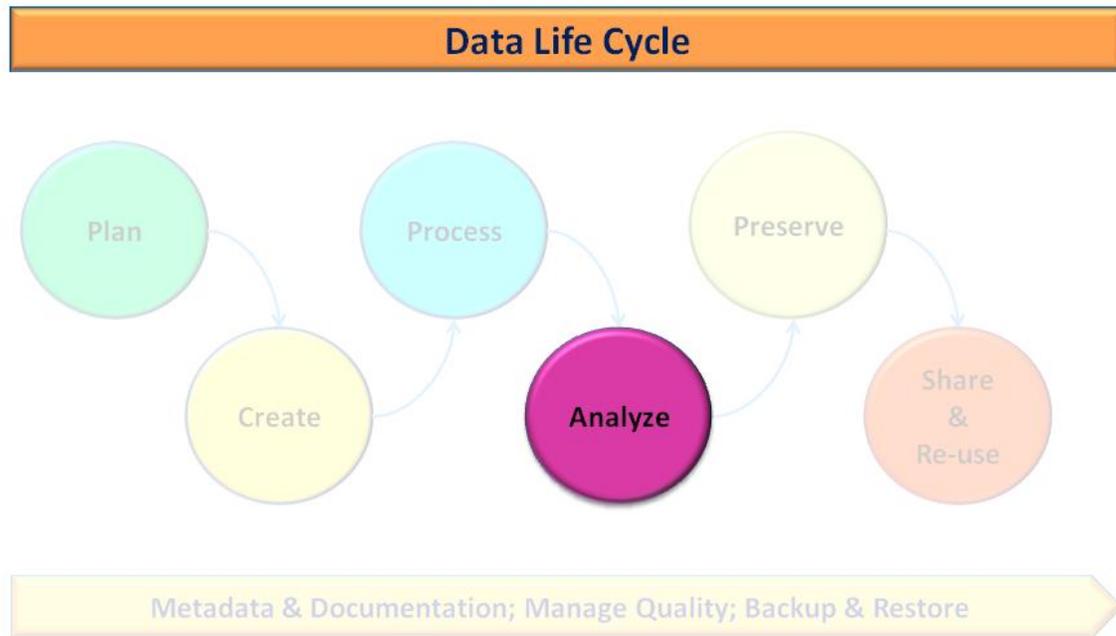
The **analyze step** of the data life cycle involves analyzing and interpreting data within the clinical context and the metadata and other documentation available to support it. This step also provides the opportunity to review the data for quality prior to publishing and sharing the data. As mentioned before in the *process step*, the implementation of quality assurance processes for data collection and submission prior to analyzing and interpreting data is important in ensuring the highest quality data within the NQuIRE data system and in effect for BPG evaluation. As such, in this section, a review of the NQuIRE reports and dashboard is discussed along with considerations around analysis and interpretation for BPSOs.

5.1 Review NQuIRE Reports & Dashboard for Quality

NQuIRE reports are released on the 1st of the month (15 days) following the quarterly submission deadline (as seen in Figure 10) after being reviewed by the NQuIRE team.

Once data have been submitted (according to the submission schedule in Figure 10), the NQuIRE reports will be available immediately for review by BPSOs. When reports are ready, BPSO lead users will receive an email indicating NQuIRE reports have been released. At this time BPSOs are expected to review their data prior to analyzing and utilizing the reports. During the review, BPSOs are expected to alert the NQuIRE team of any errors or missing data, which should be corrected promptly to ensure the integrity of the data. It is important to determine early on in the evaluation planning who will review the NQuIRE reports, and how they will be utilized within the organization as outlined in the *planning section*. A focus on the end-users of the NQuIRE report can assist in determining the performance of indicators and whether quality data are being collected. Once the data review is deemed satisfactory, only then should the

report be shared or disseminated to stakeholders. It is important to also share NQuIRE reports with clinical staff members who are implementing the BPG in order help them understand the impact of the BPG on their practice and patient outcomes.

The NQuIRE system produces three types of reports for BPSOs: (i) the BPG indicator results; (ii) BPG indicator overlay results; and (iii) dashboards. In the near future the BPSO-to-BPSO Comparison results examining like units or areas will also be included.

Remember, NQuIRE is a quality improvement evaluation tool. Thus, NQuIRE will only be as useful as what is put into it and how integral it becomes to a BPSOs evaluation of BPG implementation. Therefore, it is recommended BPSOs utilize NQuIRE reports throughout their BPG implementation and BPSO work.

5.2 Reviewing, Analyzing, & Interpreting NQuIRE Reports

The algorithm in Figure 11 on the next page provides a step-by-step overview process to follow when reviewing, analyzing and interpreting NQuIRE reports.

Figure 13: NQuIRE Reports Review Algorithm
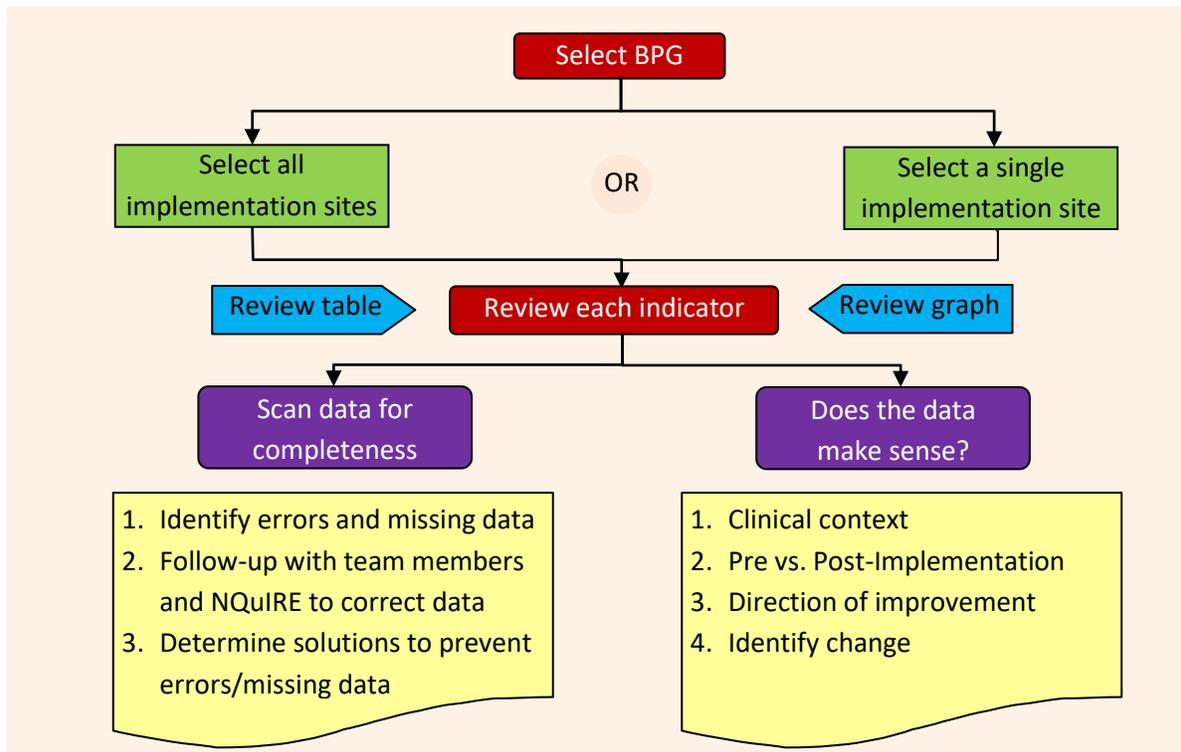
First, review each indicator for each implementation site as well as across implementation sites. Recall that, only the NQuIRE lead user account can access NQuIRE reports for all

implementation sites and, therefore, it makes the most sense for this user to conduct the review across implementation sites.

Second, when reviewing the tables and graphs for each indicator by implementation site, scan the data for completeness and identify gaps, which may show up in tables such as no submission, not reported, undefined and zero values. The meanings of each of these are explained below in section 5.2.1. For example, a confirmation that a zero value in the chart or table is indeed a zero value. This step gives the BPSO an opportunity to maintain high quality of the data in the NQuIRE system. Practising this step every quarter when reports are released will help to quickly resolve any gaps/errors in the data; it may become more difficult to extract the correct data needed. This step will also help address any challenges in data collection which can be remedied. If errors are discovered during this review, contact the NQuIRE team via the "Contact us" link on the NQuIRE site for the correction to be made in the data system.

Thirdly, the most important question while accessing the NQuIRE reports is "*does the data make sense?"* In order to answer this question comprehensively, consider the clinical context, pre-implementation versus post-implementation data and direction of improvement. The clinical context is important to making sense of the data since NQuIRE indicators are specific to certain processes and outcomes. Therefore, consider other information that is not captured in the annotation when interpreting the trends in the reports.

The annotation option is the place to capture specific clinically relevant details for the data. Understanding the direction of improvement for each indicator will assist in determining whether an improvement is occurring in association with the BPG implementation. To visually see a change, it is recommended to use run chart rules to interpret data in a meaningful way. Section 5.2.2 provides an explanation of run chart rules and how to interpret NQuIRE data.

5.2.1 Types of Data Entries in NQuIRE Report Tables

The NQuIRE auto-generated tables may show any of the following: a numerical value, no submission, not reported, undefined or zero value depending on data entered into the data system. A numerical value is easy to comprehend as it is the measure of interest for a particular indicator, therefore, the non-numerical entries of no submission, not reported, and undefined are discussed in detail here along with the zero value.

A "no submission" occurs when in previous months data was submitted for a specific BPG but not for a subsequent month. In this case, NQuIRE report will show no submission and a broken line in the graph. If there are multiple NQuIRE users submitting data to NQuIRE, it is important to verify whether the no submission is a true no submission. A BPSO may have many reasons for not submitting data for that month: (1) the data were not collected for that month; (2) the individual responsible is away or left the organization, and (3) the organization has decided to no longer collect data for a particular indicator. All of these reasons, although not ideal may be a reality, however, a "no submission" should not be interpreted for a "zero value". A "no

submission" also indicates to the NQuIRE team the potential for missing data. For that reason, the BPSO will be contacted as a quality control check during the two week-audit review phase prior to the release of the reports.

In cases where a BPSO has decided to no longer collect data for a particular BPG or change specific indicators reporting to NQuIRE, the BPSO should consult with the RNAO NQuIRE team regarding the rationale for this decision and to ensure that BPSOs continue to meet the BPSO NQuIRE requirements for BPSO designation.

A "not reported" occurs when previously data were being submitted for this indicator and although data were submitted for other indicators for a specific BPG, this particular indicator was not reported on for the specific month. A "not reported" may be intentional[3] or unintentional and indicates the potential for missing data which will result in follow-up from the RNAO NQuIRE team. For illustration, let us use Falls BPG as an example being implemented in a Cardiology unit. In 2015, data were entered into NQuIRE data system for the month of May for three process indicators: falls_pro01; falls_pro02; and falls_pro03, but in the month of June data were entered for only falls_pro01 and falls_pro02 and **not** for falls_pro03. In this case, falls_pro03 will show "not reported for the month of June"

An "undefined" occurs when the denominator value of an indicator is a zero and therefore the indicator cannot be calculated to include in the report. For example, in a particular month a long-term care home may not have any new admissions and thus the falls assessment on new admission (falls_pro01) denominator is zero which will be indicated in NQuIRE as "undefined". For quality control purposes, the BPSO will be contacted during the two week-audit review phase prior to the release of the reports.

A "zero value" is when the numerator of the indicator is a zero with a non-zero integer value in the denominator. For example, if in a particular month there are 15 new admissions and zero falls assessments are completed on those 15 newly admitted patients then the falls assessment on new admission indicator (falls_pro01) would be $0 \div 15$. A "zero value" is considered a true value in NQuIRE. In order to capture some of the nuances between no submission, not reported and a zero, BPSOs are encouraged to use the annotation option to keep track of the reasons for missing data so that if there are any inquiries, you can quickly provide an answer to explain your data. As much as possible, missing data are to be avoided and when they cannot be avoided an annotation is required to explain the reason for such missing data.

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[3] There are some instances where the missing gaps are intentional because there is a lag time for an external source that provides a BPSO with survey data on, for example, the patient's satisfaction survey.

To further highlight the differences in the non-numerical entries Example 3 below shows, all three data entry types identified for a single indicator in the reports table. In this case, Sunny Meadows Hospital started submitting Prevention of Falls and Fall Injuries in the Older Adult data in January 2015.

Example 3: Types of Data Entries in Tables

		Cardiology	Medical-Surgical Combined
Falls_Out02: Injury Falls			
Indicator Parameter	**Numerator Includes Falls While Off the Unit**	No	Yes
Percentage of Falls Resulting in Harm / Injury	January 2015	5.56 %	Not reported
	February 2015	4.76 %	3.70 %
	March 2015	6.25 %	5.45 %
	April 2015	3.33 %	8.70 %
	May 2015	2.78 %	6.12 %
	June 2015	2.00 %	Undefined
	July 2015	3.13 %	4.26 %
	August 2015	0.00 %	3.64 %
	September 2015	2.17 %	No submission
BPSO Mean (All reporting periods)			4.12 %
Notes			
No submission There is no submission from the Implementation Site for the reporting period			
Not reported There is a submission from the Implementation Site for the reporting period, but there is no data for this indicator			
Undefined The indicator data was submitted but the indicator could not be calculated (e.g. it has a denominator of zero)			

The first month, Cardiology provided outcome data but Medical-Surgical Combined provided no outcome data. For the outcome indicators, Medical-Surgical Combined shows **"Not reported"** *for January 2015* because they submitted data this month, but not for the outcome indicator. Both sites submitted data for the outcome indicators from *February 2015* through *August 2015* and this data is displayed in the report. In *June 2015*, the Medical-Surgical Combined had no documented falls and the percentage of injuries from falls (falls_out02) could not be calculated because the denominator is zero, so the report displays **"Undefined"**. In *August 2015*, the Cardiology unit reported no injuries resulting from falls (falls_out02), so the report displays **"0"** because they had a zero numerator and a non-zero denominator. Cardiology submitted their *September 2015* data, but Medical-Surgical Combined

did not. The report shows **"No submission"** for Medical-Surgical Combined for all indicators in the report because NQuIRE has no data for this month for this BPG.

5.2.2 Interpreting NQuIRE graphs: using Run chart rules

Run chart rules provide a quick and easy method to analyze and interpret NQuIRE report graphs and speak to the impact BPG implementation is having on your organization. A run chart is a graph of data points over time for a specific measure/outcome with median being the central line of tendency (Perla, Provost, & Murray, 2011). Figure 12 below shows an example of a run chart for a process indicator for the Reducing Foot Complications for People with Diabetes BPG. The dotted line represents the median, which is the midpoint in the dataset. In run charts, the median is utilized over the mean (average) as it is less influenced by extreme values or outliers in your dataset and it represents the central point in your data with half the data points above and below the center line. Note, a run chart does not account for variation and cannot determine whether the performance measure is stable.

In order to use run chart rules, a minimum set of ten data points is needed thus the consistent collection of monthly data is key in being able to make use of the run chart rules.

Figure 14: Run chart for Process indicator from DFU BPG
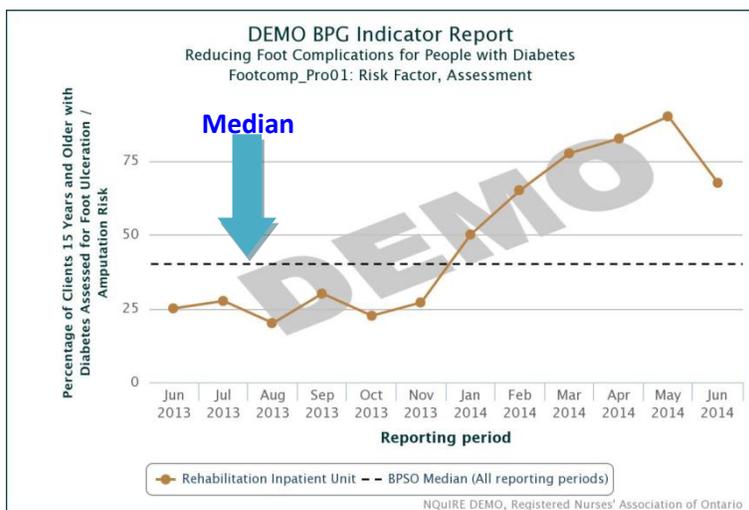
In NQuIRE, to apply the run chart rules setup your NQuIRE report as follows;
  I.   Select the BPG indicator results tab from the menu bar on the right
  II.   Select a single BPSO Implementation Site
  III. Select the Median as the aggregate calculation for indicator(s)
  IV.   Select all Reporting Periods In Report under Select the timeframe the aggregate calculation covers
  V.   Select Line Graph for the graph type

There are four run chart rules that can be used to interpret your NQuIRE data; shift, trend, runs, and astronomical point. All four run charts can be applicable to a single run chart however depending on the context one run chart rule may be more appropriate or clear to identify over

others. Aside from the astronomical point, as long as one of the run chart rules apply, then it can be stated that a statistically significant change has occurred in the data and that it is due to the practice changes being implemented. The run chart rules are as follows;

- **Shift**- six or more consecutive points either all above or below the median, not counting values which fall on the median (Perla, Provost, & Murray (2011). From Figure13 below two shifts can be identified one below the median and one above the median.

Figure 15: Identifying a shift
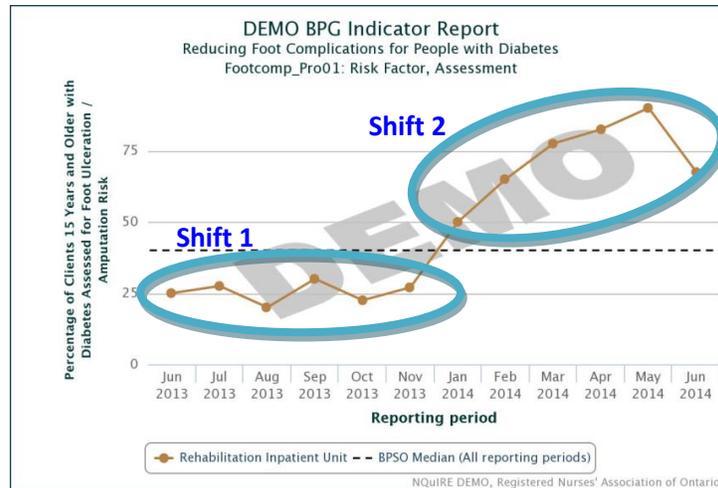
- **Trend**- five or more consecutive points all going in the same direction either up or down, not counting a repeating value twice (the second repeating value is ignored however this does not affect whether a trend is identified) (Perla, Provost, & Murray (2011). The Figure 14 below illustrates a trend with 7 data points all going up.

Figure 16: Identifying a trend
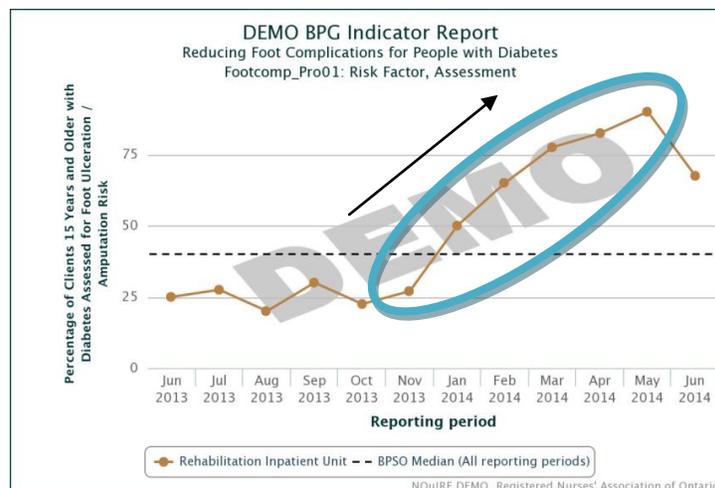
- **Too many or too few runs**- a run is a series of points either above or below a median. Too few or too many runs determine whether there is a non-random pattern in your

dataset which indicates a statistically significant change in your data (Perla, Provost, & Murray (2011).

There are two ways to count the number of runs that appear on the run chart. The first method is to count the number of series of data points either above or below the median. Figure 17 below shows that there are two runs circled in blue.

Figure 17: Identifying runs
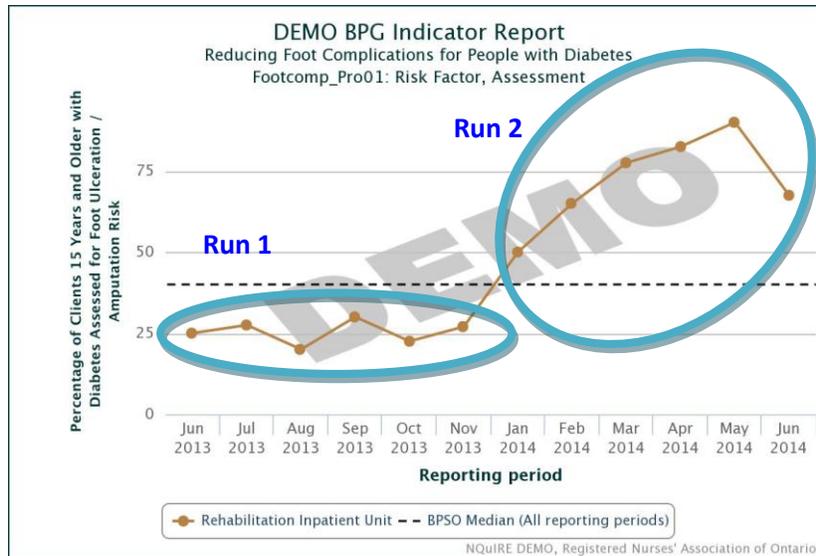
The second method is to count the number of times the data set cross the median line and add 1. Hence in Figure 15, the dataset crosses the median only once and by adding 1 it can be concluded that there are two runs. Now, how do you know if there is a non-random pattern here?

In order to identify a non-random pattern using runs, a minimum set of ten data points is needed thus the consistent collection of monthly data collection is key in being able to make use of the run chart rules. The Table 14 below, outlines too few or too many runs dependant on the size of the dataset (Refer to Appendix E on p.64 for the full table). Looking at Figure 17 again, the dataset has 12 data points and has two runs. Table 14 below can be used to identify whether there is a significant change. Referring to Table 14, it is evident that two runs is too few (i.e. less than 3 runs) and thus signalling a significant change has occurred in the data. Thus, the run chart in Figure 15 can be interpreted to state that a significant improvement in the percentage of clients with diabetes assessed for foot ulcers or amputation risk has occurred.

Table 14: Run Table

Total number of data points (exclude points on median)	Too few runs	Too many runs
10	<3	>9
11	<3	>10
12	<3	>11
13	<4	>11
14	<4	>12
15	<5	>12

Adapted from Perla, Provost, & Murray (2011)

When using the too few or too many runs rule, the data points on the median line are not counted towards the total number of data points for the run table. In Figure 16 below, there are 21 data points in the dataset. When using the run table, the three data points on the median line would have to be subtracted leaving you with 18 data points. Now you would be able to use the runs table in order to interpret the graph correctly.

Figure 18: Total number of data points for runs
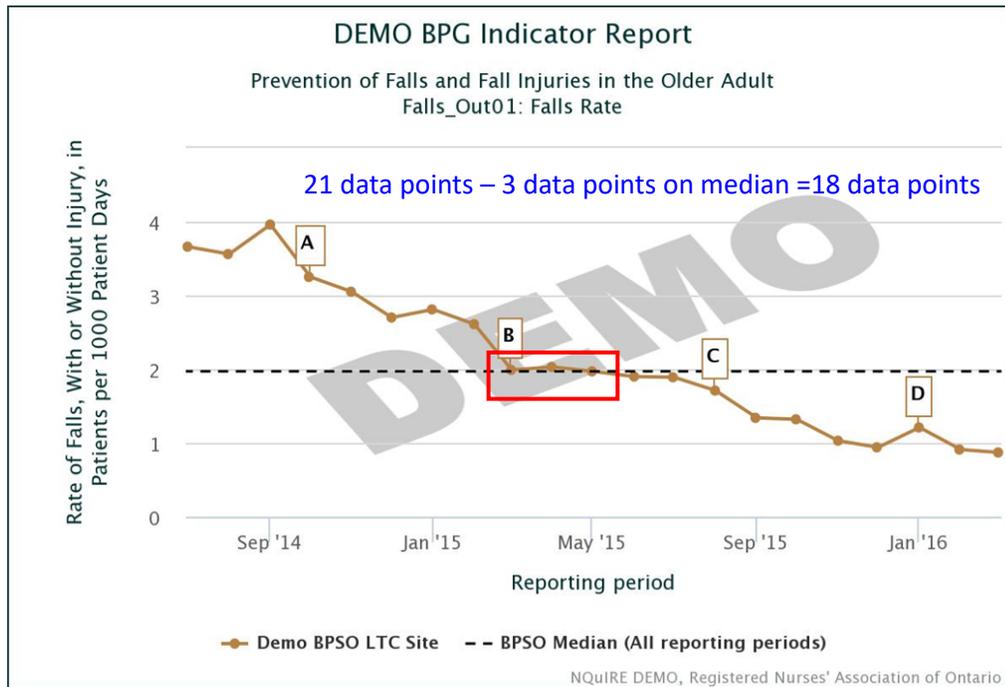
- *Astronomical point*- a data point which is visibly different from the rest of the points which is also known as an outlier (Perla, Provost, & Murray (2011). The identification of this data point is subjective in nature as it may require clinical judgment to identify. For example, percentage of falls assessment on new admission completed (falls_pro01) may be reported as 90 per cent every month except for two months where the percentage

dropped to 75 per cent and another 30 per cent. Depending on the clinical context of the data for each of those months that the percentage dropped, one or both may be considered an astronomical point.

The run chart rules outlined above allow the interpretation of your data in order to determine whether the implementation of specific practice recommendations of a BPG associated with an indicator can be shown through significant changes in the NQuIRE data. It is important to remember that NQuIRE indicators are a proxy for measuring whether BPG implementation is having an impact on BPG-specific process and outcome indicators. These rules are simple to apply and provide you with a quick interpretation of your data, which can easily be shared amongst nursing staff, senior management, and members of the interprofessional team.

6.0 PRESERVE NQuIRE DATA

Data Life Cycle
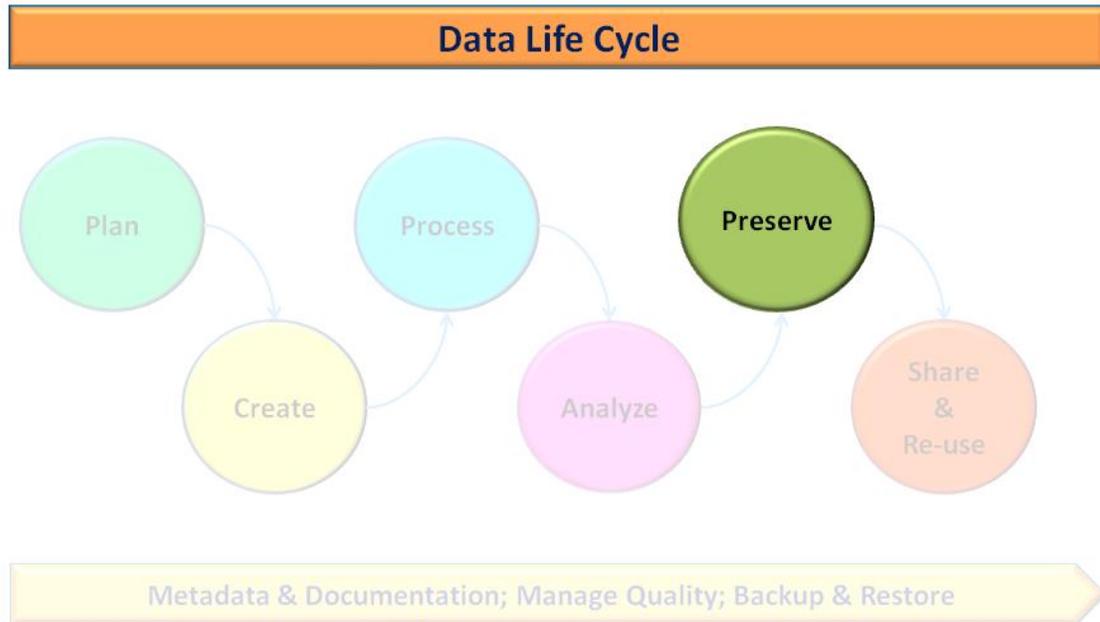
Data preservation involves ensuring data can be accessed in future with appropriate security and back-up measures in place. It is recommended that all data collected for NQuIRE is saved by the BPSO in a central location so that, if needed, it can be accessed for follow-up or to clarify any issues with the data submitted to NQuIRE. This allows for quality control checks to be conducted internally within a BPSO as well as with the RNAO NQuIRE team during follow-up after auditing a BPSO's submitted data or during BPSO site visit.

7.0 SHARE & RE-USE NQuIRE DATA

Data Life Cycle

Plan → Create → Process → Analyze → Preserve → Share & Re-use

Metadata & Documentation; Manage Quality; Backup & Restore
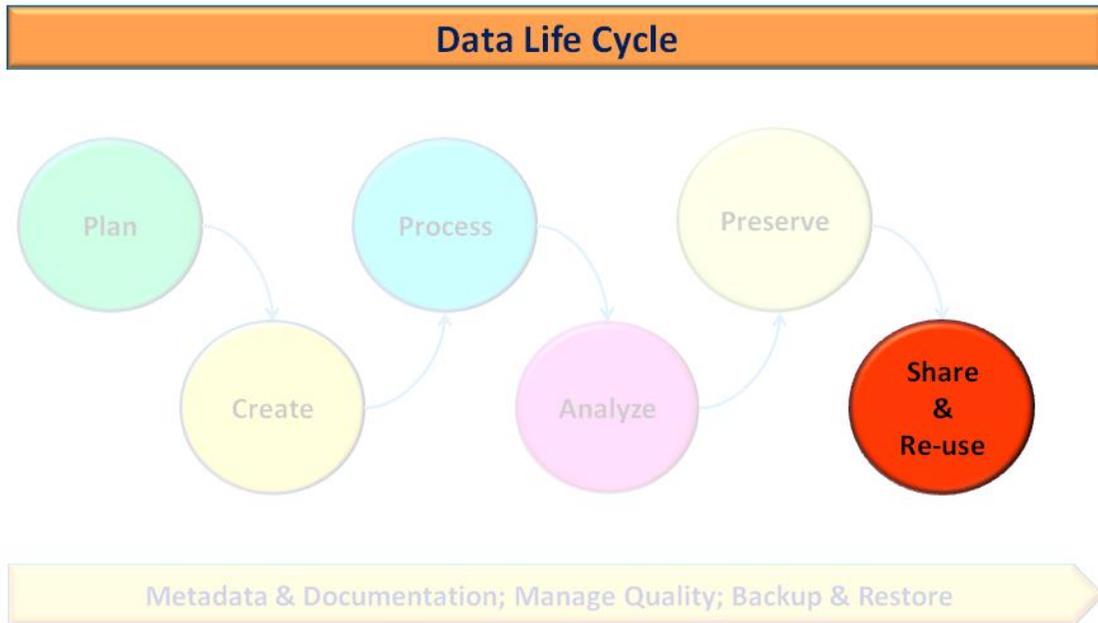
BPSOs can share and re-use NQuIRE tables, graphs and dashboards as needed. BPSOs are encouraged to share their NQuIRE data across their organization with clinical nursing staff, senior leadership, and others including the board of directors to support BPSO work as well as show the impact of BPG implementation to key stakeholders.

It is important for BPSOs when re-using NQuIRE data to be clear about how NQuIRE data will be re-used and for what purpose. Since NQuIRE data is primarily quality improvement data, this is a key consideration when using the data for other purposes.

8.0 CONCLUSION

This guide provides the overall approach needed for data quality management for NQuIRE data. This guide should be referred to by all members of the BPSO NQuIRE team prior to initiating NQuIRE participation and for those that are already familiar with NQuIRE, this guide will aid in further supporting a BPSO's participation in NQuIRE. The aim of this guide is to ensure BPSOs have a systematic and process driven approach to data quality management in order to ensure the highest quality data for BPSOs to utilize within NQuIRE reports, dashboard and BPSO comparison reports in the near future. The better the quality of data housed within NQuIRE, the more able NQuIRE will be to highlight the impact of BPGs within BPSOs.

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APPENDIX A: NQuIRE® GETTING STARTED GUIDE

This guide was developed to provide a timeline for all phases of NQuIRE participation. Please note timelines can be subject to change.

Plan for NQuIRE: Preparation Phase (Month 1-3)	Resources Required	Complete ✔
Sign NQuIRE's data agreement	RNAO BPSO Senior management	
Identify and form an NQuIRE team who will assist with developing and supporting a data management plan	BPSO Senior management BPSO lead(s)/BPG lead(s) BPSO Clinical Informatics /Decision Support/IT Other stakeholders as appropriate	
Attend BPSO Launch	BPSO lead(s) and relevant team members	
Identify BPGs that have indicators	BPSO NQuIRE team	
Identify participating nursing units/programs/services	BPSO NQuIRE team	
Request an invitation NQuIRE Demo Site and practice registration/indicator selection activities	BPSO lead user and others BPSO/NQuIRE Project Coordinator	
Provide training to other team members in the NQuIRE Demo Site	BPSO lead user BPSO implementation site user(s)	
Plan for NQuIRE: Registration Phase (Month 4)	**Resources Required**	**Complete ✔**
Attend 1st NQuIRE orientation session – key terms, enrollment and registration, and reading data dictionaries	NQuIRE team	
Get invited to the NQuIRE Live Site	BPSO/NQuIRE Project Coordinator	
Review User Manual and training videos # 1-5	https://nquire.rnao.ca/user-manual https://nquire.rnao.ca/training-videos	
Enroll your BPSO by setting up your BPSO Lead account	Training videos	
Invite Implementation Site Users (if applicable)	Training videos	
Register Implementation Sites	Training videos	
Download data dictionaries and review indicators	NQuIRE Site	
Plan for NQuIRE: Planning for data creation, processing, & analysis Phase (Month 5)	**Resources Required**	**Complete ✔**
Attend 2nd NQuIRE orientation session – Indicator selection, data sources, identify team & sampling	NQuIRE team	
Finalize indicator selection: • Structure indicators • BPG-specific process and outcome indicators	BPSO team	
Finalize data collection plan	BPSO team	

Plan for NQuIRE: Planning for data creation, processing, & analysis Phase (Month 5)	Resources Required	Complete ✔
Finalize sampling size/methods and Implementation Sites	BPSO team	
Assign and train staff member(s) on data collection	BPSO Lead	

Create & process data for NQuIRE: Data Collection Phase* (Month 6)	Resources Required	Complete ✔
Finalize Implementation Site Users (if applicable)	BPSO Lead	
Start collecting monthly data for Q3	BPSO team	
Attend 3rd NQuIRE orientation session – data collection/submission schedule and online/import templates	NQuIRE team	
Finalize data submission method (online vs. import template)	BPSO team IT/decision support	
Assign and train staff member(s) on data submission	BPSO Lead	

Analyze & share NQuIRE data: Evaluation Phase* (Month 7)	Resources Required	Complete ✔
Attend 4th NQuIRE orientation session - interpreting and using your reports for quality improvement	NQuIRE team	
Develop plan for disseminating reports within organization and to whom	BPSO team Senior management	
Submit data to NQuIRE	BPSO Lead/Implementation Site User(s)	
BPSO Lead receives report from NQuIRE	NQuIRE site	
Disseminate findings to identified stakeholders	BPSO Lead	

*The Data Collection and Evaluation Phase is ongoing after Q3

APPENDIX B: INDICATOR SELECTION PROCESS TEMPLATES

In order to select **process** and **outcome** indicators, identify which practice recommendations are being implemented for each BPG and select process indicators that align with the recommendations from the corresponding data dictionary. The outcome indicators are applicable to all recommendations and it is up to the individual to determine which are most relevant. It is recommended that both BPSO leads and BPG leads are involved in this process. To do this exercise, ensure you have downloaded the most recent Data Dictionaries from NQuIRE website.

Table 15: Identify Potential Process & Outcome Indicators for NQuIRE

BPG Title:	Publication Date:
Practice Recommendation(s) *For each BPG, identify which practice recommendations you have implemented, those you are implementing currently and those you plan to implement in future.*	**Process indicator(s)** *Using the data dictionary identify process indicators which link to each practice recommendation for implementation*
Practice Recommendation(s) *Generally, outcome indicators are linked to all practice recommendations however there may be specific outcome indicators which are pertinent to specific practice recommendation(s)*	**Outcome indicator(s)** *It is important to identify which of the outcome indicators are most important to the improvement/change you want to see through BPG implementation*

Once you have identified corresponding indicators, determine which of those indicators will be feasible to collect and the most informative for your organization. Again, this will be an iterative process as you will need to determine your potential data sources, the implementation sites which can collect this data, and how this data will be extracted in order to submit to NQuIRE. At this stage, it is relevant to include Clinical Informatics and IT/Decision Support in the process.

Table 16: Select Indicators for NQuIRE

Indicator name *(structure, process, or outcome)*	Data Source(s) *Identify all the possible data sources (electronic, paper, hybrid)*	Data quality considerations *(Identify any potential challenges with the numerator, denominator, inclusion/exclusion criteria, documentation, etc.)*	Implementation site(s) *(Identify the implementation sites where this data could be collected)*

BPSOs are encouraged to select at least one process and one outcome indicator for each BPG so that data patterns or trends can be portrayed within the NQuIRE reports. Identifying data sources, implementation sites, and potential data quality considerations will aid in finalizing the NQuIRE indicators. At the beginning, start with a few implementation sites to become comfortable with NQuIRE and then scale-up once your organization has a clearly defined data collection process.

In order to select structure indicators, identify which human resources structure indicators are most relevant to measure within your organization. The most recent version of the Human Resources Structure Indicators Data Dictionary can be downloaded from the NQuIRE website. Structure indicators in combination with process and outcome indicators provide informative data patterns, trends and shifts regarding your BPG implementation. We recommend that BPSOs submit structure indicators for implementation sites for which they are collecting process and outcome indicators.

APPENDIX C: IDENTIFY THE TARGET POPULATION

BPG Title: _____

Purple Circle: Identify your target population for this BPG

- For whom is this BPG being implemented? (e.g. all older adult patients)
- Where is this BPG being implemented? (e.g. all inpatients units)

Green Circle: Identify where data will be collected for NQuIRE

- Is the BPG being implemented organization-wide?
- Will data collection for NQuIRE capture all areas where BPG is being implemented or a fraction?
- Will data collection follow BPG implementation spread across the organization?

Red Circle: Identify which patients will be included in the sample?

- All patients or a sample will be selected?
- If a sample will be selected, how will patients be sampled and who will be included or excluded?
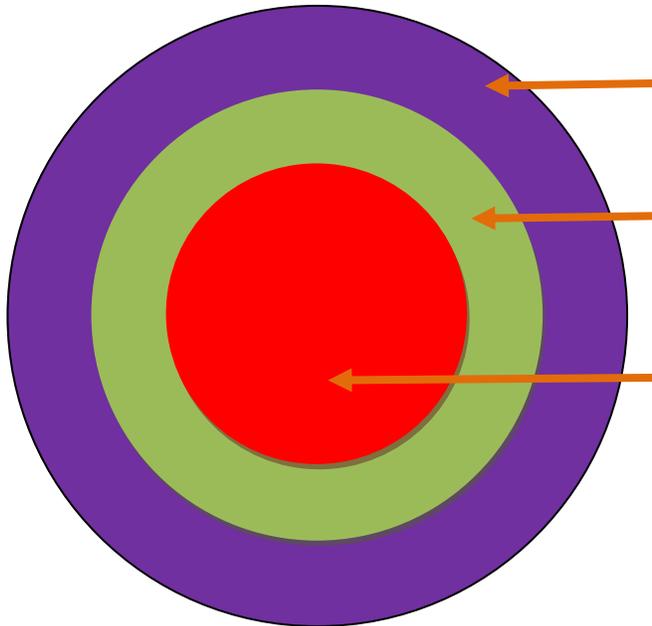
APPENDIX D: NON-PROBABILITY SAMPLING METHODS

Non-probability sampling includes convenience, volunteer, judgment, and quota sampling methods. Non-probability sampling methods are not recommended but are described below in Table 8 as a reference to BPSOs (Statistics Canada, 2013).

Table 17: Non-Probability Sampling Methods

Non-probability Sampling	Description	Example
Convenience	The sample is selected based on convenience and how easily accessible the data is. The sample is not normally representative of the target population.	A home care agency only receives client's charts in home office post-discharge and often many charts are left in nurses' car trunks or patients' homes and rarely come to home office as active charts. The nurse in charge of collecting data chooses a sample of charts at home office available for chart audits.
Volunteer	This sampling involves individuals volunteering to be part of the sample	Client satisfaction surveys mailed back by patients post-discharge
Judgment	The individual collecting the data makes the decision around who to include in the sample	The BPSO decides to focus on sampling older adults for restraint use instead of all patients in the hospital.
Quota	A quota for the sample is decided and then individuals in similar units are selected for the sample using any method until the quota is met	A BPSO decides to sample 100 patients every month and take the first 100-patient charts that they come across to include in the sample

APPENDIX E: TABLE TO CHECK IF THERE ARE TOO MANY OR TOO FEW RUNS IN A RUN CHART

Too few or too many runs (i.e. crossing of the median line) signals a statistically significant change

*Remember to add 1 to the number of times the data set crosses the median line

# data points (not including data points on median)	If # < x, then too few runs	If # > x then too many runs
10	3	9
11	3	10
12	3	11
13	4	11
14	4	12
15	5	12
16	5	13
17	5	13
18	6	14
19	6	15
20	6	16
21	7	16
22	7	17
23	7	17
24	8	18
25	8	18
26	9	19
27	10	19
28	10	20
29	10	20
30	11	21
31	11	22
32	11	23
33	12	23
34	12	24
35	12	24
36	13	25
37	13	25
38	14	26
39	14	26
40	15	27
41	15	27
42	16	28
43	16	28
44	17	29
45	17	30

Adapted from Perla, Provost, & Murray (2011)