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Measuring Nurses' Graph Literacy

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Abstract

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Disciplines

Nursing

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Measuring Nurses' Graph Literacy

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Abstract

Increasingly, healthcare data used in nursing practice is visualized using graphs. However, studies show that low graph literacy is found in significant numbers in both the general population and in nurses. Even so, the concept of graph literacy is relatively unknown within healthcare and measuring baseline graph literacy isn't standardized. The 4-item GLS questionnaire is a brief, validated, healthcare-domain-specific scale developed by Galesic and Garcia-Retamero (2011), and assesses graph literacy by measuring comprehension of four frequently used graphs (simple pie, bar and line charts and icon array). Along with measuring baseline graph literacy, a video tutorial reviewing the four graphs and a re-designed graph used to test usability and utility were implemented to better understand and enhance graph comprehension in recently onboarded, entry-level, hospital nurses. The self-selecting, small sample size garnered enough data to run non-parametric tests, and although there were no statistically significant findings in tests for differences or correlations, measuring baseline graph literacy and identifying ways to enhance graph comprehension remain clinically significant. The qualitative and quantitative analysis challenged assumptions and will inform future graph literacy studies in hospital nurses.

keywords: graph literacy, data literacy, data visualization, graphicacy, nurses

Measuring Nurses' Graph Literacy

Literacy is a non-intuitive, learned ability to read, interpret, understand, apply and extrapolate information and meaning from a communication medium (Galesic & Garcia-Retamero, 2013). Data visualization literacy is then the ability to consume data or information that is visually represented in charts or diagrams (Galesic & Garcia-Retamero, 2013). Data visualization encompasses both numeracy (numbers) and graph literacy (quantitative data presented in graph form); though certain industries such as the financial and research sectors may focus on more specific associated literacies, such as risk and statistical literacies (Ybarra et al., 2017; Galesic & Garcia-Retamero, 2011). Graph literacy, then, is the ability to read, understand and appropriately apply information that is graphically presented (Galesic & Garcia-Retamero, 2013).

Introduction

Problem

Hospitals do not measure graph literacy in hospital nurses. Across the nursing practice spectrum, from executive to bedside roles, data-driven decisions are quickly becoming the expected norms (Bakken et al., 2019). Increasingly, healthcare data used in nursing practice is visualized using graphs. Clinical, administrative, quality and performance dashboards are accompanying or altogether replacing textual and tabular reports (Yoon et al., 2016; Dowding et al., 2015). More than ever, the ability to read graphically presented data is as important as the ability to read text (Börner et al., 2019). However, functional graph literacy remains a challenge among the general population, including nurses (Dowding et al., 2018a; Galesic & Garcia-Retamero, 2011).

The primary barrier to graph literacy assessment is the general lack of awareness of the phenomenon within healthcare: of graph literacy being a measurable construct, and of the existence of a graph literacy gap. Despite studies of graph literacy among students, patients and the general population, measurement of graph literacy in clinical providers is rare (Lopez et al., 2016). Other barriers include a lack of healthcare domain and role-specific graph literacy assessment tools, as well as a lack of established training modules and instruction programs (Talboy & Schneider, 2017). Institutional barriers such as time and resource constraints also endanger efforts to promote improved graph literacy in nurses. Successful strategies to promote graph literacy among nurses will require engaging all stakeholder groups to initiate and sustain a cohesive effort towards bridging the graph literacy gap.

Background and Significance

About one-third of the general population has low graph literacy (Galesic & Garcia-Retamero, 2011), even among the educated populace. This is particularly concerning as people with low graph literacy may not fully understand critical health information presented in graphical form (Bakker et al., 2017). In a study of home care nurses, approximately one-fourth were found to have low graph literacy (Dowding et al., 2018a, p. 180). A similar study noted that nurses with low graph literacy had difficulty comprehending quality targets that were graphically represented (Dowding et al., 2018b). The impact of poor graph literacy can exhibit in adverse behaviors: avoidance in making critical decisions, misrepresentations of presented data, non-compliance with best-practice recommendations and policy mandates and all these can result in poor patient outcomes in clinical settings (Dowding et al, 2018a; Dowding et al, 2018b; Keenan et al., 2017).

Measurement of graph literacy is essential because it reveals the baseline competency of the intended audience and helps inform the development of effective data products (Yoon et al., 2016; Dowding et al., 2018a). Baseline measurements of nurses' graph literacy may help anticipate whether the nurse will be able to understand and use a dashboard or report, and which changes need to be made to support the users' graph literacy level. Moreover, enhancing graph comprehension requires graph designs that align with utility and usability principles, such as those outlined in Nielsen's Usability Heuristics, the AHRQ Usability Toolkit and Dowding's (2018c) heuristics for dashboard design evaluation. In addition to well-designed graphs, knowledge of and familiarity with frequently used graphs may help promote graph comprehension. Galesic and Garcia-Retamero (2011) highlighted that the ability to effectively read, interpret and apply information gleaned from graphs is a learned skill, therefore, teaching the basic techniques for understanding frequently used graphs using data that is contextually appropriate or known to the study participants may supplement graph comprehension of well-designed graphs.

Local Site

Memorial Sloan Kettering Cancer Center in New York City, formerly New York Cancer Hospital, is the largest and oldest cancer treatment and research institution in the world. A Magnet hospital, it is also a designated National Cancer Institute Comprehensive Cancer Center. In the varying hospital capacities, a nurse may be tasked with utilizing a dashboard or graph report to glean important treatment information, assess compliance with quality benchmarks, or monitor initiative or program performance targets. For example, nurse leaders piloting a program to decrease falls in the inpatient setting requested a dashboard to graphically present the volume

of nursing orders placed to initiate patient monitoring, as well as a representation of the program's impact to the pilot units' falls rate over time. The dashboard decreases the administrative burden in gathering, analyzing, and disseminating key program information to a multitude of stakeholders.

However, according to Nancy Houlihan, Memorial Sloan Kettering Cancer Center's (MSK) Director of Evidence-Based Nursing, the lack of formal or structured assessment of graph literacy or graph literacy training for nurses in leadership and research roles is of particular concern. Key administrative and practice information are often communicated graphically, often with little or no textual context or onboarding; and the dangers of misinterpretation or delayed action can result in adverse consequences and missed opportunities (personal communication, May 3, 2019). Anecdotal discussions with dashboard development team members and clinical users highlight that poor graph literacy is a phenomenon of concern at MSK. However, there remains a lack of a broad awareness, formal acknowledgement, and structured measurement of graph literacy within the institution.

Thus, this project aims to 1) identify the baseline graph literacy in entry-level (CN1) nurses at MSK, and to 2) develop effective graph designs and training modules to enhance graph comprehension. The success metrics are 1) at least 80% participation with at least 50% completed responses and 2) a statistically significant increase in mean graph utility questionnaire scores.

Methods

Context

A Magnet-recognized institution, the Department of Nursing at MSK has approximately 5,000 nurses staffing screening centers, outpatient practices and treatment sites, acute inpatient units, urgent care centers, as well as diagnostic and procedural areas. The roles within the department include registered nurses, nurse practitioners, clinical nurse specialists, clinical research nurses, nurse educators, nursing clinical analysts, physician referral coordinators, case managers, certified registered nurse anesthetists and unlicensed assistive personnel. Every month approximately 50 newly hired entry-level nurses (recent graduates and second careerists), are enrolled in an 18-month long nursing orientation and mentoring program at MSK. However, the COVID-19 pandemic decreased the number of monthly orientees to as low as seven or one in some months. Fortunately, we were able send recruitment emails to CN1 cohorts onboarded in 2020, especially those earlier in the year prior to the lockdown and social distancing strictures. This prospective study conducted pre- and post- testing using this convenience sample from a cohort of entry-level nurses.

Interventions

Implementation was conducted in two phases: Phase 1 assessed the participants' baseline graph literacy using the Graph Literacy Scale (GLS), collected demographics, and performed an initial assessment of the utility of four graphs developed specifically for this study. The graphs' content was based on oncology nursing data framed in an operational or clinical question (such as benchmark compliance rates, infection trends, or proportion of patients impacted). Phase 2 presented a tutorial covering the four basic graphs delivered via a brief, animated video tutorial,

a re-design of the graphs to increase their usability (ease-of-use) and utility (usefulness), and a final assessment testing the utility of the four re-designed graphs.

The animated video tutorial articulated the significance of efficient and accurate graph interpretation and its impact on healthcare delivery and outcomes. It also provided an overview of the purpose and uses of the four frequently used graphs. Lastly, the graph re-design embedded supportive visual cues and context to enhance the participants' graph comprehension, regardless of their baseline graph literacy.

The 4-item, short GLS questionnaire (Appendix A) is the successor to the original 13-item, healthcare-domain-specific scale developed by Galesic and Garcia-Retamero (2011), which was validated in probabilistic adult participants in the United States and Germany with a Cronbach's $\alpha = 0.85$. The GLS assesses graph literacy by measuring comprehension of four frequently used graphs (simple pie, bar and line charts and icon array); the original version takes approximately 15 minutes to complete, while the shorter version takes about 4 minutes. In the US, the GLS has been used to assess graph literacy in nurses and other healthcare providers (Dowding et al., 2018; Keenan et al., 2017; Lopez et al., 2016; Izard et al., 2014). The GLS is administered once, in the beginning of the study, to determine participants' baseline graph literacy. Low graph literacy is defined as less than the median score. The developers have permitted the use of the GLS in this study.

The demographic questionnaire (Appendix B) is adopted from Dowding et al.'s (2018) study and takes approximately 5 minutes to complete. It assesses sex, age, race, educational degrees, staffing type, and years of nursing and non-nursing work experience.

The utility questionnaire (Appendix C) evaluates a specific graph's usefulness by assessing the user's comprehension of the graph content. The utility questionnaire is used for pre- and post- testing and takes approximately 5 minutes to complete. The utility questionnaire is not a proprietary tool or singularly developed by authors but is based on evaluation principles promulgated by Nielsen's Usability Heuristics and the AHRQ Usability Toolkit. Similar utility assessments were used in Daeschler et al. (2019) and Sivagnanasundaram et al. (2016) studies. The post-test utility questionnaire uses the same graph and essential content but will test on different data points (for example, the pre-test may ask for the compliance rate for Q3 2018 while the post-test may ask for the compliance rate for a different quarter/year). The utility questionnaire predominantly measures graph comprehension using objective, quantitative questions, but it also utilizes subjective, qualitative responses to assess the participants' perceptions of the graph's usefulness.

Both the Phase 1 and 2 surveys, including the video tutorial, were made available via Research Electronic Data Capture (REDCap), an open source platform developed by Vanderbilt University and for which MSK has a standing agreement with to allow the usage for academic/research purposes. This offered an accessible and intuitive medium for participants to complete the surveys at their convenience. Data collected for this study will be managed via a secure REDCap Database and housed in MSK's New Jersey data center.

Analysis

The GLS is given once to determine the participants' baseline graph literacy. To measure whether the interventions enhanced graph comprehension, the utility pre & post test scores were assessed using the Wilcoxon signed-rank test. Only questions that are quantifiable were assessed

using statistical tests. The free-text responses to subjective questions were assessed qualitatively to describe and explore the meaning and impact of the participants' perceptions.

Moreover, the Spearman rank-order correlation coefficient was used to identify relationships between the independent and dependent continuous variables. For example, age with GLS and pre-test utility scores, and GLS with pre-test utility scores. The data were analyzed using IBM SPSS Statistics (Version 26) predictive analytics software.

Ethical considerations

Two Institutional Review Boards (IRB) separately reviewed and approved this study, MSK and University of Pennsylvania, to be conducted at MSK. The authors would like to acknowledge the contribution of the faculty and site leads and the cooperation of the MSK nursing staff.

Results

Project implementation began in October 2020 with data collection ending in November 2020. There were 79 eligible participants, 21 (27%) of whom responded to at least one of the three Phase 1 surveys, with 15 (71%) subsequently completing all surveys in Phase 1 and 2. Halfway through project implementation, to increase both the response and completion rates, a small financial incentive ($10 electronic gift card) was offered to participants who complete all surveys. Scheduled REDCap reminders as well as email reminders sent by MSK nursing leadership were also instrumental in improving responses.

Quantitative & Qualitative Findings

Sociodemographic characteristics are outlined in Table 1 (Appendix D). In brief, most of the participants were female (n = 14, 93%), in their twenties (n = 12, 80%), White (n = 10, 67%)

had another non-nursing degree (n = 11, 73%), had high baseline graph literacy (n = 10, 67%), and an equally high pre-test utility score (n = 12, 80%). All the participants correctly answered items 1 and 2 in the GLS survey, while 9 (60%) answered item 3 correctly, but only 4 (27%) answered item 4 correctly. Similarly, all the participants correctly answered items 1 and 2 in both the pre- and post- utility questionnaires. However, only 2 (13%) participants correctly answered item 3 in the pre-, and only 1 (0.7%) correctly answered item 3 in the post- utility questionnaire. Fortunately, 12 (80%) participants correctly answered item 4 in the pre-, and 11 (73%) correctly in the post- utility questionnaire.

The Wilcoxon test showed a non-significant decrease in mean utility scores (Z = -.816, p = 0.414), with the pre-test mean at 2.93 and a post-test mean of 2.80. Similarly, tests for correlation between continuous independent and dependent variables showed non-significance: moderate, negative association between age and GLS score (r_s = -.318, p = .249), and weak, negative association between GLS and pre-test utility scores (r_s = -.118, p = .675).

Free-text demographic data showed that participants had diverse backgrounds, with experience working in non-nursing, healthcare-related industries as well as non-healthcare fields. Qualitative feedback from both pre- and post- utility questionnaires showed some participants found the questionnaire “fun” and the graphs “explanatory”, while others requested a clearer title and an easier-to-read graph (larger picture, bigger font, more axis marks, clearer scales, bigger font, etc). Most found the utility questionnaire’s pre- and post- test graphs to have completely answered the assessment questions (n = 14, 93% and n = 13, 87%). For the one participant who thought the pre- utility graph did not help at all, their pre- utility score was 2, and their GLS was 3. For the two participants who thought the post- utility graph only partially answered the

assessment questions, both their post- utility scores were 2 but they differed in their baseline GLS (1 and 3).

Missing Data

Records by respondents who did not complete all three Phase 1 or Phase 2 surveys were excluded from the final data analysis. Certain non-mandatory demographic data such as type of non-nursing degree, years of non-nursing working experience, and years in a type of industry/role were not always filled in even though the parent or leading question was answered affirmatively. For example, a response of Yes to having a non-nursing degree but no response to the type of non-nursing degree. Incomplete data (left blank or not answered) were either categorized as non-responses or as a negative (No).

Discussion

Summary

Although we did not meet our participation rate goal of 80%, we did have more than 50% of our respondents complete all Phase 1 and 2 surveys. And although we did not find a significant increase in mean pre- and post- graph utility scores, we were able to conveniently and effectively measure baseline graph literacy in CN1 nurses. We were also able to develop and implement a sustainable medium to administer the GLS and utility assessments in addition to presenting the tutorial & graph re-design interventions.

Interpretation

Interestingly, certain survey questions pinpointed pain points that were shared by most of the participants: item 4 on the GLS and item 3 on the pre- and post- utility questionnaires. Item 4 on the GLS showed two line graphs with different slopes, and both lacked scales or axis

labels/marks. The correct answer is it is not possible to compare the two graphs, however, most participants may have stopped at comparing the steepness of the slopes and did not account for the missing scales. One of the two participants who answered this item correctly had a degree and working experience in a STEM field, while the other neither had a non-nursing degree nor prior working experience. Similarly, there were no distinguishing sociodemographic factors associated with correctly answering item 3 on the pre- and post- utility questionnaires.

The non-significant findings from tests of differences and correlations highlight the importance of measuring not only baseline graph literacy, but also in carefully designing appropriate graphs that will be used in actual practice. Meaning, a high graph literacy score does not guarantee comprehension of all basic graph types, especially if the graph is poorly designed or the data being presented is fairly complex or too unfamiliar to be adequately presented in one graph without providing prior training, additional context or substantial graphical support (annotations, footnotes, etc).

Self-selection may have accounted for the high baseline graph literacy found in the participants. Having other non-nursing work experience and/or having a degree in another field may have benefited the participants by granting them more opportunities to create or use graphs. This previous experience with graphs may also have contributed to the limited, voluntary viewing of the video tutorial. Lastly, two initial respondents to Phase 1 only completed the demographics survey and did not continue on to complete the GLS or pre- utility surveys. These two participants may have avoided completing the remaining surveys due to a lack of familiarity with, confidence in, or interest in completing graph comprehension assessments. Even so, standardizing baseline graph literacy measurement in all staff nurses across all practice settings

may equally benefit those with high and low graph literacy by identifying those that would stand to gain from structured training on basic graph types, and those that could help validate the usability and utility of graphs to be used in actual practice.

Limitations

Our self-selecting, small sample size (N = 15), which was conveniently sampled and limited to only hospital CN1 nurses, preclude the generalizability of our findings to the larger nurse population and to its varied practice settings. The GLS is also specific to four frequently used, basic graph types and does not account for other frequently used graph types or more advanced graph types. Moreover, only 7 (47%) distinct (unidentified) views of the video tutorial was logged. Additionally, the study could have benefited from more PDSA cycles to better understand and formulate interventions, such as on-site/live focus groups, education sessions, and iterative graph re-designs. Lastly, testing usability and utility on graphs that are actually used or will be used in practice may offer more immediate strategies to enhance graph comprehension than non-specific, sample graphs (such as the ones used in this project).

Conclusion

The GLS REDCap implementation provides a convenient and effective method to measure baseline graph literacy in hospital nurses. The baseline graph literacy can be used to provide insights to the challenges faced by nurses when using basic graph types and informs which interventions may be more suited to supporting the wide range of graph literacies that may exist within each practice setting or role. Notwithstanding this project's small sample size and non-significant findings, awareness of graph literacy gaps within nursing, remain and continue to be relevant to practice.

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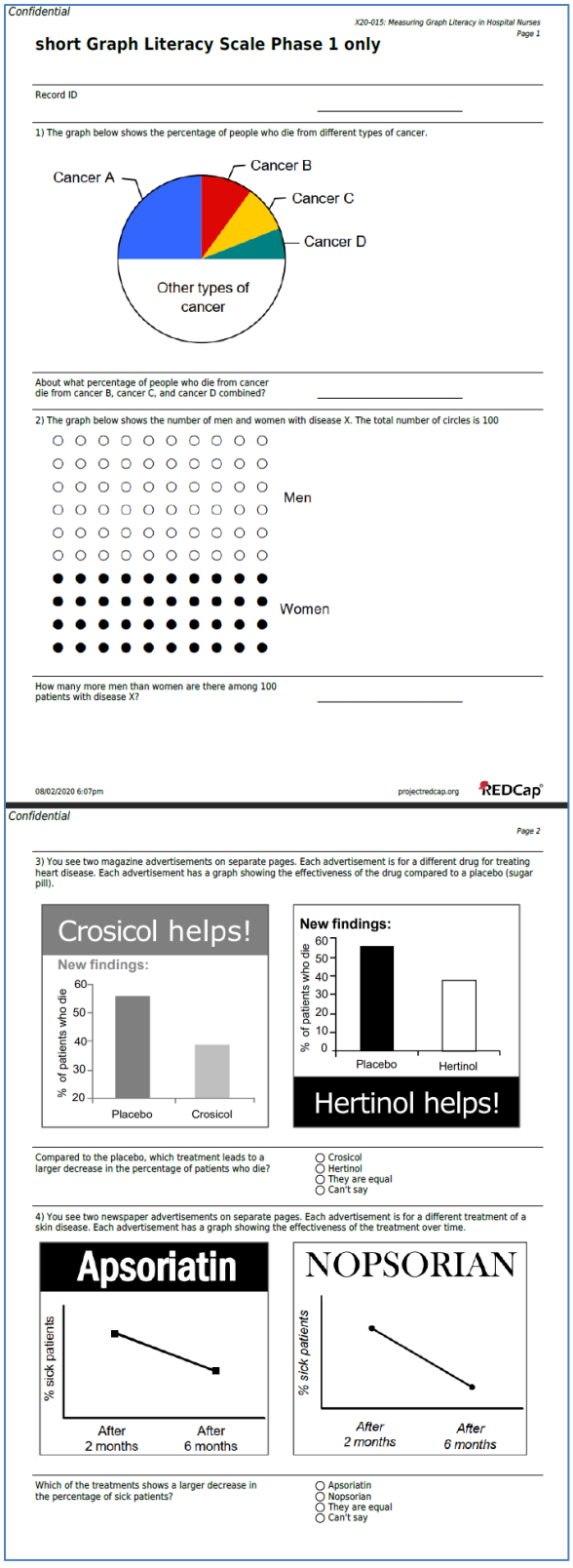
Appendix A



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Page 1

short Graph Literacy Scale Phase 1 only

Record ID _____

1) The graph below shows the percentage of people who die from different types of cancer.

About what percentage of people who die from cancer die from cancer B, cancer C, and cancer D combined? _____

2) The graph below shows the number of men and women with disease X. The total number of circles is 100

How many more men than women are there among 100 patients with disease X? _____

08/02/2020 6:07pm projectredcap.org REDCap

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Page 2

3) You see two magazine advertisements on separate pages. Each advertisement is for a different drug for treating heart disease. Each advertisement has a graph showing the effectiveness of the drug compared to a placebo (sugar pill).

Compared to the placebo, which treatment leads to a larger decrease in the percentage of patients who die?

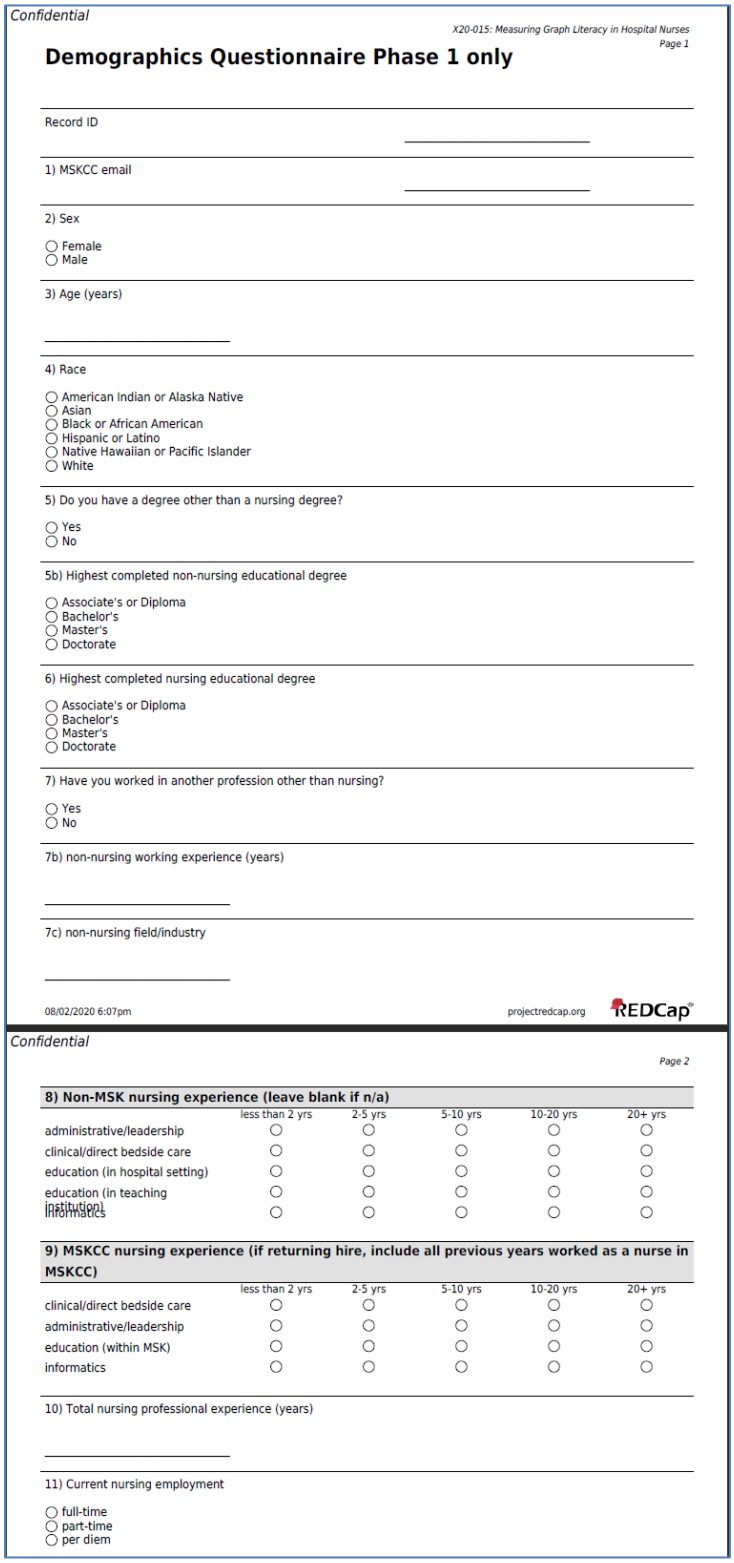
- ○ Crosicol
- ○ Hertinol
- ○ They are equal
- ○ Can't say

4) You see two newspaper advertisements on separate pages. Each advertisement is for a different treatment of a skin disease. Each advertisement has a graph showing the effectiveness of the treatment over time.

Which of the treatments shows a larger decrease in the percentage of sick patients?

- ○ Apsoriatin
- ○ Nopsorian
- ○ They are equal
- ○ Can't say

Appendix B



Confidential

X20-015: Measuring Graph Literacy in Hospital Nurses
Page 1

Demographics Questionnaire Phase 1 only

Record ID _____

1) MSKCC email _____

2) Sex

○ Female
○ Male

3) Age (years)

_____

4) Race

○ American Indian or Alaska Native
○ Asian
○ Black or African American
○ Hispanic or Latino
○ Native Hawaiian or Pacific Islander
○ White

5) Do you have a degree other than a nursing degree?

○ Yes
○ No

5b) Highest completed non-nursing educational degree

○ Associate's or Diploma
○ Bachelor's
○ Master's
○ Doctorate

6) Highest completed nursing educational degree

○ Associate's or Diploma
○ Bachelor's
○ Master's
○ Doctorate

7) Have you worked in another profession other than nursing?

○ Yes
○ No

7b) non-nursing working experience (years)

_____

7c) non-nursing field/industry

_____

08/02/2020 6:07pm projectredcap.org REDCap

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Page 2

8) Non-MSK nursing experience (leave blank if n/a)

	less than 2 yrs	2-5 yrs	5-10 yrs	10-20 yrs	20+ yrs
administrative/leadership	○	○	○	○	○
clinical/direct bedside care	○	○	○	○	○
education (in hospital setting)	○	○	○	○	○
education (in teaching institution)	○	○	○	○	○
informatics	○	○	○	○	○

9) MSKCC nursing experience (if returning hire, include all previous years worked as a nurse in MSKCC)

	less than 2 yrs	2-5 yrs	5-10 yrs	10-20 yrs	20+ yrs
clinical/direct bedside care	○	○	○	○	○
administrative/leadership	○	○	○	○	○
education (within MSK)	○	○	○	○	○
informatics	○	○	○	○	○

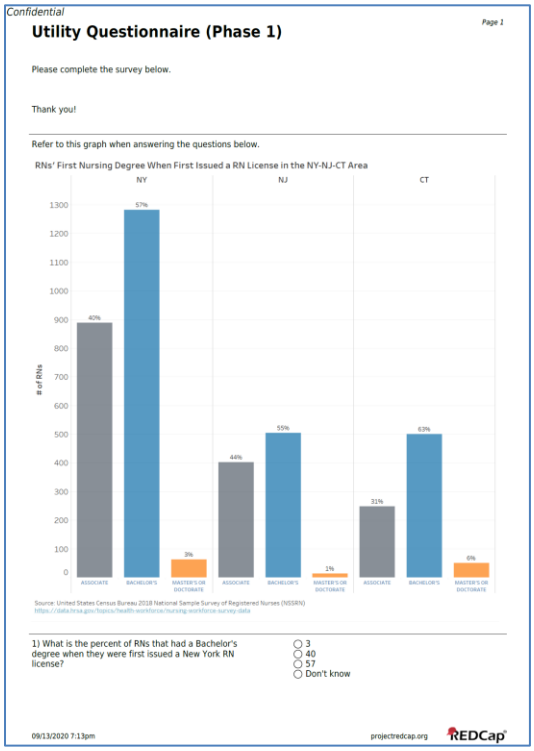
10) Total nursing professional experience (years)

_____

11) Current nursing employment

○ full-time
○ part-time
○ per diem

Appendix C



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Page 1

Utility Questionnaire (Phase 1)

Please complete the survey below.

Thank you!

Refer to this graph when answering the questions below.

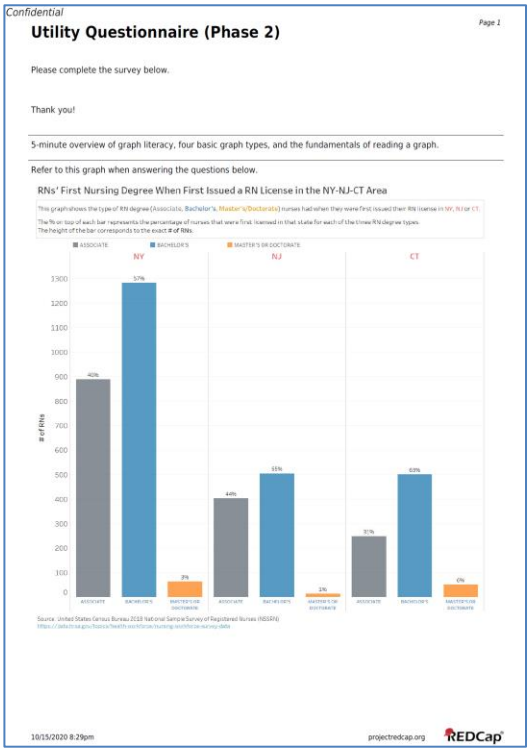
RNs' First Nursing Degree When First Issued a RN License in the NY-NJ-CT Area

Source: United States Census Bureau 2018 National Sample Survey of Registered Nurses (NSSRN)
https://data.hrsa.gov/Topics/health-workforce/nursing-workforce-survey-data

1) What is the percent of RNs that had a Bachelor's degree when they were first issued a New York RN license?

- ○ 3
- ○ 40
- ○ 57
- ○ Don't know

09/13/2020 7:13pm projectredcap.org REDCap



Confidential

Page 1

Utility Questionnaire (Phase 2)

Please complete the survey below.

Thank you!

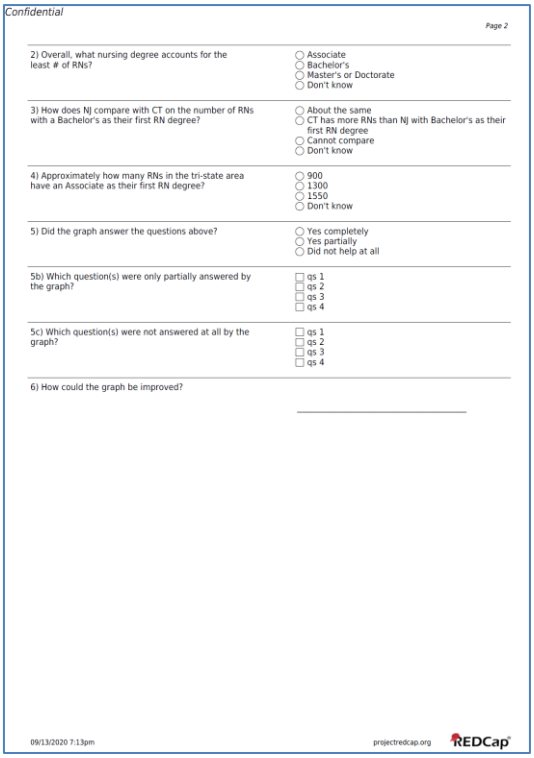
5-minute overview of graph literacy, four basic graph types, and the fundamentals of reading a graph.

Refer to this graph when answering the questions below.

RNs' First Nursing Degree When First Issued a RN License in the NY-NJ-CT Area

Source: United States Census Bureau 2018 National Sample Survey of Registered Nurses (NSSRN)
https://data.hrsa.gov/Topics/health-workforce/nursing-workforce-survey-data

10/15/2020 8:29pm projectredcap.org REDCap



Confidential

Page 2

2) Overall, what nursing degree accounts for the least # of RNs?

- ○ Associate
- ○ Bachelor's
- ○ Master's or Doctorate
- ○ Don't know

3) How does NJ compare with CT on the number of RNs with a Bachelor's as their first RN degree?

- ○ About the same
- ○ CT has more RNs than NJ with Bachelor's as their first RN degree
- ○ Cannot compare
- ○ Don't know

4) Approximately how many RNs in the tri-state area have an Associate as their first RN degree?

- ○ 900
- ○ 1300
- ○ 1550
- ○ Don't know

5) Did the graph answer the questions above?

- ○ Yes completely
- ○ Yes partially
- ○ Did not help at all

5b) Which question(s) were only partially answered by the graph?

- ☐ qs 1
- ☐ qs 2
- ☐ qs 3
- ☐ qs 4

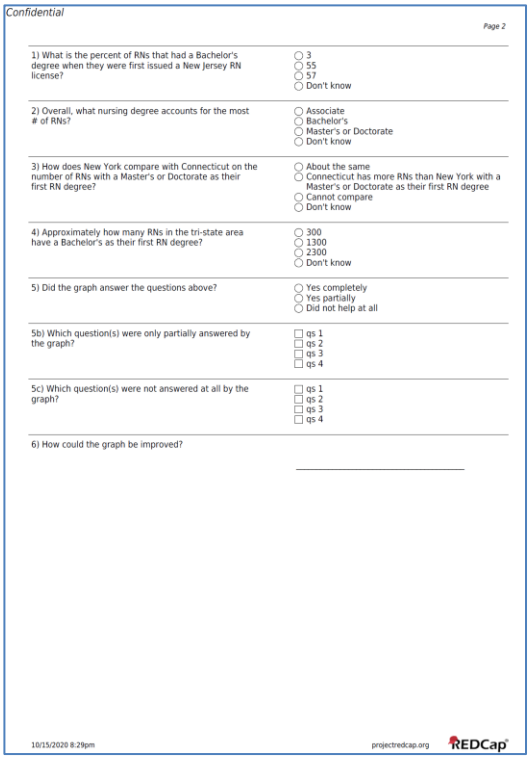
5c) Which question(s) were not answered at all by the graph?

- ☐ qs 1
- ☐ qs 2
- ☐ qs 3
- ☐ qs 4

6) How could the graph be improved?

_____

09/13/2020 7:13pm projectredcap.org REDCap



Confidential

Page 2

1) What is the percent of RNs that had a Bachelor's degree when they were first issued a New Jersey RN license?

- ○ 3
- ○ 55
- ○ 57
- ○ Don't know

2) Overall, what nursing degree accounts for the most # of RNs?

- ○ Associate
- ○ Bachelor's
- ○ Master's or Doctorate
- ○ Don't know

3) How does New York compare with Connecticut on the number of RNs with a Master's or Doctorate as their first RN degree?

- ○ About the same
- ○ Connecticut has more RNs than New York with a Master's or Doctorate as their first RN degree
- ○ Cannot compare
- ○ Don't know

4) Approximately how many RNs in the tri-state area have a Bachelor's as their first RN degree?

- ○ 300
- ○ 1300
- ○ 2300
- ○ Don't know

5) Did the graph answer the questions above?

- ○ Yes completely
- ○ Yes partially
- ○ Did not help at all

5b) Which question(s) were only partially answered by the graph?

- ☐ qs 1
- ☐ qs 2
- ☐ qs 3
- ☐ qs 4

5c) Which question(s) were not answered at all by the graph?

- ☐ qs 1
- ☐ qs 2
- ☐ qs 3
- ☐ qs 4

6) How could the graph be improved?

_____

10/15/2020 8:29pm projectredcap.org REDCap

Appendix D

Table 1

Sociodemographic Characteristics of Participants

Baseline characteristic	n	%	low Graph Literacy		low pre Graph Utility score		low post Graph Utility score	
			n	%	n	%	n	%
Sex								
Female	14	93%	5	36%	3	21%	4	29%
Male	1	7%	0	0%	0	0%	0	0%
Age (years)								
>= 20	12	80%	3	25%	2	17%	2	17%
>= 30	3	20%	2	67%	1	33%	2	67%
Race								
American Indian or Alaska Native	0	0%	0	0%	0	0%	0	0%
Asian	4	27%	1	25%	2	50%	2	50%
Black or African American	0	0%	0	0%	0	0%	0	0%
Hispanic or Latino	1	7%	0	0%	1	100%	1	100%
Native Hawaiian or Pacific Islander	0	0%	0	0%	0	0%	0	0%
White	10	67%	4	40%	0	0%	2	20%
Has a non-nursing degree [a]	11	73%	4	36%	2	18%	4	36%
Highest non-nursing degree								
Associate's or Diploma	0	0%	0	0%	0	0%	0	0%
Bachelor's	10	67%	3	30%	2	20%	4	40%
Master's	1	7%	1	100%	0	0%	0	0%
Doctorate	0	0%	0	0%	0	0%	0	0%
no response	4	27%	1	25%	1	25%	0	0%
Highest nursing degree								
Associate's or Diploma	0	0%	0	0%	0	0%	0	0%
Bachelor's	15	100%	5	33%	3	20%	4	27%
Master's	0	0%	0	0%	0	0%	0	0%
Doctorate	0	0%	0	0%	0	0%	0	0%
Worked in a non-nursing profession [a]	7	47%	1	14%	1	14%	3	43%
non-MSK administrative/leadership role [a]	8	53%	3	38%	1	13%	2	25%
non-MSK clinical nursing role [a]	7	47%	2	29%	1	14%	1	14%
non-MSK hospital education role [a]	7	47%	2	29%	1	14%	1	14%
non-MSK education (teaching institution) role [a]	6	40%	2	33%	0	0%	0	0%
non-MSK informatics role [a]	7	47%	2	29%	0	0%	1	14%
MSK administrative/leadership role [a]	6	40%	2	33%	0	0%	0	0%
MSK clinical nursing role [a]	13	87%	5	38%	3	23%	3	23%
MSK hospital education role [a]	6	40%	2	33%	0	0%	0	0%
MSK informatics role [a]	7	47%	2	29%	0	0%	1	14%

Note. *N* = 15. Low graph literacy or low utility score is a score of less than or equal to 2 (4-item assessment).

[a] Reflects the number and percentage of participants answering "yes" or filled in a response to this question.