Nurses' Use of mHealth Functions

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Abstract. Nurses' use of mHealth remains largely unexplored despite enthusiasm for its use in health systems. We conducted a survey (n=341) to examine nurses' use of mHealth technologies in Canada; this paper presents findings of sub questions within a larger study. Differences in common mHealth functions used by nurses were examined by population setting (large urban centre, medium centre, small centre, and rural area) and type of organization (hospital, community health, nursing home or long-term care, and other). A significant difference by population setting was found in the use of the mHealth functions to support decision making. Significant differences by type of organization were found in the use of the mHealth functions for care plans, outside communication, general/basic documentation, accessing information resources, and 'other' functions. Results from this study are the first to provide details of the current state and nature of nurses' use of mHealth.

Keywords. Nursing, mHealth, health technology, nursing informatics, telehealth

1. Introduction

There is continued interest to better understand the nature of mobile health technology (mHealth) use by healthcare providers. Broadly, mHealth refers to using mobile information and communication technologies as tools for health service delivery and improving health outcomes [1]. Commonly described benefits include the potential for mHealth to deliver or bolster health services in the face of increasing demand and constrained resources [1]. Nurses' use of mHealth is shaped by both individual and organizational factors [2-4]. In Canada, some insight into nurses' mHealth has been explored within broad national surveys on digital health, revealing a low use of mobile devices [5]. In 2017, the highest rate of use (7%) was for electronic communications [5]. However, few survey questions explored the use of mHealth specifically; as such, whether there are any unique uses of mHealth (i.e., functions accessed by mHealth only and not by desktop/stationary devices) remains unknown.

Within a larger study on nurses' use of mHealth in clinical practice, the following research questions were explored in this paper: 1) What are the most common functions of mHealth that nurses report using in clinical practice? 2) How are mHealth functions distributed across population settings (rural/urban), and organization types (hospital, community health, nursing or long-term care, other)? and 3) Is there a difference in mHealth functions used based on population setting and organization type?

2. Methods

2.1. Survey Development and Distribution

An online survey [6] with both closed- and open-ended questions was used. Convenience sampling was employed as the exploratory nature of the proposed research necessitated a broad reach. The dispersed nature of mHealth use by nurses in Canada did not make it possible to identify sufficient practice areas, institutions, or organizations where nurses used mHealth routinely and could be targeted in the sampling frame. Moreover, participants' sharing of the online survey to colleagues who fit the inclusion criteria (i.e., snowball sampling) comprised an important strategy to increase the reach of this study to the intended target groups [7-12]. This ease of sharing survey information was not possible with alternative sampling/recruitment methods. Advertisement and distribution of the online survey was done through social media [13], and via Registered Nurse (RN) registration bodies in Canada with email lists of registrants interested in participating in scientific studies. Participant eligibility screening questions were presented to all potential participants and access to the survey was granted for participants who: 1) held current RN licensure in Canada, 2) provided direct patient care in any type of setting, 3) had access to employer-provided mHealth for use in their nursing work, and 4) spoke English. In this study, mHealth was described as *"The use of mobile and portable information and communication devices as a tool in your nursing work. Devices that you might use for mHealth include handheld computers, personal digital assistants (PDAs), mobile phones (basic and smart phones), tablet computers, laptops, wearable devices, and mobile sensing technologies."* Eligible participants were asked to provide informed consent before completing the survey and were free to stop at any time. Data were collected using the Qualtrics web survey platform from January to July 2018. Participants could enter prize draws for electronic gift certificates ($15 CAD weekly for 22 weeks and/or $150 CAD at the end of the study) for the duration of the data collection period. Ethical approval was received from the local University Research Ethics Board.

A list of 12 mHealth functions were identified from the literature and practice; participants were asked to choose all functions used in their practice. Functions included: general/basic documentation, medication documentation (e.g., bar code), care plans, view patient information, discharge planning, support decision making (e.g., risk assessment), accessing information resources (e.g., medication information), patient and/or family teaching, communicate with patients (e.g., schedule appointments), communicate with professionals outside of health care (e.g., social care, housing, social support, etc.), coordinate staff rostering, and other. Free text responses that accompanied 'other' were reviewed and re-categorized into existing categories where possible. function category.

2.2. Data Analysis

Descriptive statistics of respondent characteristics were computed along with cross-tabulations of mHealth use by: population setting (large urban, medium, small, and rural population centres) and organization type (hospital, community health, nursing home or other long-term care facility, other). Differences in the use of mHealth functions across population settings and organization types were explored with Chi-square statistics. Data analyses were conducted using SPSS Statistics Version 25.0.

3. Results

A total of 341 responses were included in the analyses. Respondents' mean age was 42.4 years (range 23-72). Most respondents were RNs working in large urban settings, primarily in hospital and community health (Table 1). The five most commonly used mHealth functions were: accessing information resources, viewing patient information, general/basic documentation, patient and/or family teaching, and outside communication (i.e., communicating with professionals outside of health care).

Table 1. Participant characteristics.

Characteristics		N (%)
Type of population setting	Large urban population centre	194 (54%)
	Medium population centre	46 (12.8%)
	Small population centre	43 (12%)
	Rural area	58 (16.2%)
Organization type	Hospital	133 (37%)
	Community health	137 (38.2%)
	Nursing home or other long-term care facility (LTC)	35 (9.7%)
	Other	36 (10%)

Note: Large urban population centre (>100,000 people; high population density); Medium population centre: (Between 30,000 and 99,999 people; high population density); Small population centre: (Between 1,000 and 29,999 people; high population density); Rural area: All other areas outside of population centres.

Accessing information resources was the most commonly used function reported by respondents across all population setting types, and coordinating staff rostering via mHealth was the least commonly used function reported (Figures 1 & 2). No significant differences were found between different population settings in terms of types of functions used, with the exception of the function 'support decision making' (Table 2).

Differences in the use of mHealth for general/basic documentation, accessing information resources, and 'other', were found between hospital and other organizations. Significant differences were also found in the use of mHealth for care plans (between nursing home/LTC and other organizations) and outside communication (between community health and other organizations) (see Table 2).
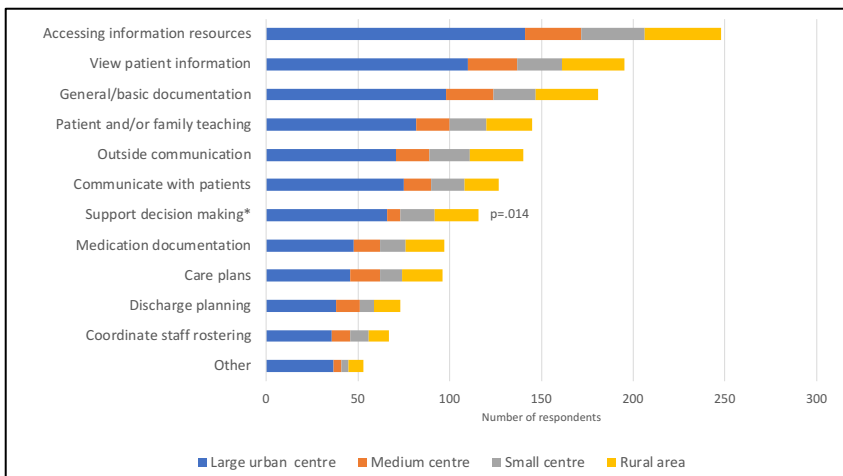

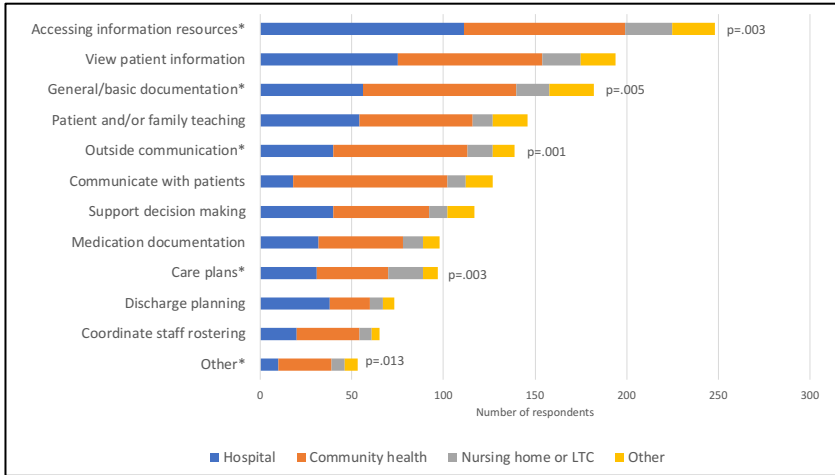**Figure 1.** Nurses' use of mHealth functions by population setting.

Figure 2. Nurses' use of mHealth functions by organization.

Table 2. Chi-Square tests of mHealth functions.

mHealth function	Chi-square by population setting	df	Sig.
Support decision making	10.63	3	.014
Chi-square by organization type			.
Care plans	13.89	3	.003
Outside communication	16.02	3	.001
Accessing information resources	14.17	3	.003
General/basic documentation	12.87	3	.005
Other	10.773	3	.013

4. Discussion

There was one significant difference when comparing the use of mHealth functions across population settings and in a number of mHealth functions used between organization types. A potential explanation is that the type of organization plays a larger role in dictating the clinical needs and subsequent mHealth function requirements of nurses, as compared to broader population settings. For example, the mHealth functions used by nurses in hospitals, whether in a large urban setting or a rural setting, may be similar because the core scope of practice for nurses is well founded [14]. The use of care plan functions via mHealth was found to be significantly different in nursing home and long-term care facilities as compared to other organization types, which may be explained by the fact that nurses are more likely to be the lead clinical care plan personnel and overall care coordinators in these types of organizations [15]. A significant difference was found in the use of outside communication in community health, as compared to other organization types. This difference may be explained by the likelihood that nurses in community health are using mHealth devices for liaising with various community partners (e.g. social work, housing), in line with communication being a core competency for effective public health [16]. 'Other' types of mHealth were more common in the community setting; activities supported by mHealth bear further description.

5. Conclusions

This is the first study, to the authors' knowledge, to provide detailed insight into the nature of mHealth functions used by nurses. While additional work focused on better understanding mHealth use among nurses is needed, the more granular understanding of the current state and nature of mHealth function use by nurses as found in this study has great potential to be leveraged in the conception, development, and planning of future mHealth technologies that will be most useful for nurses.

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