Improving Usability, Safety and Patient Outcomes with Health Information Technology
F. Lau et al. (Eds.)

doi:10.3233/978-1-61499-951-5-133

Effects of Telenursing Triage and Advice on Healthcare Costs and Resource Use

Hanne GIDORA[a,b,1], Elizabeth M. BORYCKI[b], Andre W. KUSHNIRUK[b]
[a]*ClinicalInformatics, Primary Care and Community, Provincial Health Services Authority, Canada*
[b]*School of Health Information Science, University of Victoria, Canada*

Abstract. Telenursing triage and advice services are continuing to expand both nationally and internationally. A primary role of telehealth nursing triage is to channel patients or clients towards appropriate levels of care, thereby reducing healthcare costs and freeing up resources. Purpose: The objective of this research is to: (a) present an overview of the current research, (b) describe the extent to which telenursing services are fulfilling this role, (c) identify gaps in the literature and (d) propose future research directions. Methods: The report consists of a scoping review of current literature based on the framework suggested by Arkseyand O'Malley (2005). Results: Although the available research spans a variety of jurisdictions, which makes comparison difficult, there is some evidence that suggests telenursing services empower clients to access levels of care in keeping with the severity of their symptoms, as well as enabling clients to engage in self-care when appropriate. This in turn leads to cost savings for the broader health care system. Conclusion: More evaluation of telenursing programs is needed to identify consistent savings. Health outcomes should be a part of the research.

Keywords. telehealth, nursing informatics, cost, patient outcomes

1. Introduction

Healthcare costs on an international level are steadily increasing, often at a rate faster than the Gross Domestic Product (GDP). Since the turn of the century, healthcare spending per capita has more than doubled in OECD countries [1]. In 2017, Canada spent CA$6,604 per capita on health care. The largest portion of health care funds goes to hospitals (28%) followed by drug costs (16%) and physicians (15%) [2].In spite of ever increasing expenditures, access to health care and health care facilities in Canada has not changed extensively. According to Statistics Canada, 15.8% of Canadians did not have a regular health care provider in 2016 [3]. Of those Canadians who did, roughly 40% report they are able to get a same day or next day appointment with their primary care physician. 65% of Canadians find it very difficult or somewhat difficult to access care after hours; often the only available facility is the emergency department (ED). In 2014-2015, there were 16 million visits to EDs in Canada, with 90% of visits concluded within 8hours. Only 10% of ED visitors were admitted to hospital, which suggests that at least some of the patients could have been cared for in less urgent health care settings.

[1]Hanne Gidora, 1239 Oxbow Way, Coquitlam, BC, V3E 1N1, Canada, E-Mail: hgidora@shaw.ca

Telenurse call centres have been established in many countries to help citizens seek appropriate levels of care for their symptoms, which may include use of home treatments for minor complaints. This scoping review examines the effects of telenursing services on overall healthcare in terms of cost and resource use by asking the following questions: (1) Is there any evidence that callers will follow the advice and recommendations given by telenurses? (2) Does the fact that they have contacted a telenursing service lead to more appropriate health care decisions? (3) Does the cost of providing call centre services have a positive impact on reducing overall health care costs?

2. Specific Aims

The aim of this scoping review is to identify the current state of the literature regarding the effectiveness of telenurse call centres in supporting citizen callers to make more appropriate health care decisions, and if this is leading to resource and cost savings within the broader healthcare system.

3. Background and Significance

Telenursing is a relatively new branch of nursing. It is defined as the provision of nursing care in a remote fashion, usually over the telephone without face-to-face contact between client and care provider. Stand-alone telenursing services have grown substantially over the past twenty years, often in response to health care provider shortages and the increasing need to use scarce resources wisely. In Canada, 10/13 provinces and territories provide telenursing triage and advice services [4]. Services commonly include symptom triage, recommended levels of care, general health information and education, referrals to other services, and the administration of specialized programs. Many telenurses work in call centre settings, accepting calls from the general public on a multitude of health related concerns. There are several costs that arise from operating nurse call centres: the initial cost of setting up these services, and ongoing operating costs. It is timely to investigate if tele-triage services have a positive effect on the health care system in general as callers/citizens are seeking more appropriate care e.g. trying home treatment rather than a doctor visit, or a scheduled MD visit rather than a visit to ED.

4.Methodology

This scoping review of the recent literature is based on the framework suggested by Arksey and O'Malley [5]. Step 1 involved developing research questions as stated in section 1 above. For step 2 a search was conducted of the CINAHL and PubMed databases for articles from 2004 onwards, in English language, with the search terms “tele triage”; “telenursing benefit”; “telenursing cost”; “nurse telephone hotline”; “telenursing evaluation”; “telenursing”; “telenursing impact”; “telenursing outcomes” and “telephone triage”. Selected articles were required to refer to telenursing triage and advice as the main objective, or at least as a prominent feature of the overall purpose of the study. Studies were required to report data for measures or indicators used to document telenursing triage and advice outcomes. Articles that did not meet the majority

of the inclusion criteria were excluded, together with case studies, systematic reviews, review articles, editorials, opinion letters to the editor, and commentaries. The search generated 1917 articles for abstract review. After removing duplicates there were 1035 remaining articles. Exclusion criteria included articles that were not focusing on teletriage and advice, teletriage and advice services not performed by nurses, and where the call was not initiated by the caller/client. 101 articles were chosen for full text review. At this stage, exclusion criteria were articles that did not address evaluation of teletriage and advice, articles that focused on nursing experience or nursing practice, or where the only measure was caller satisfaction. 23 articles were included in the final review.

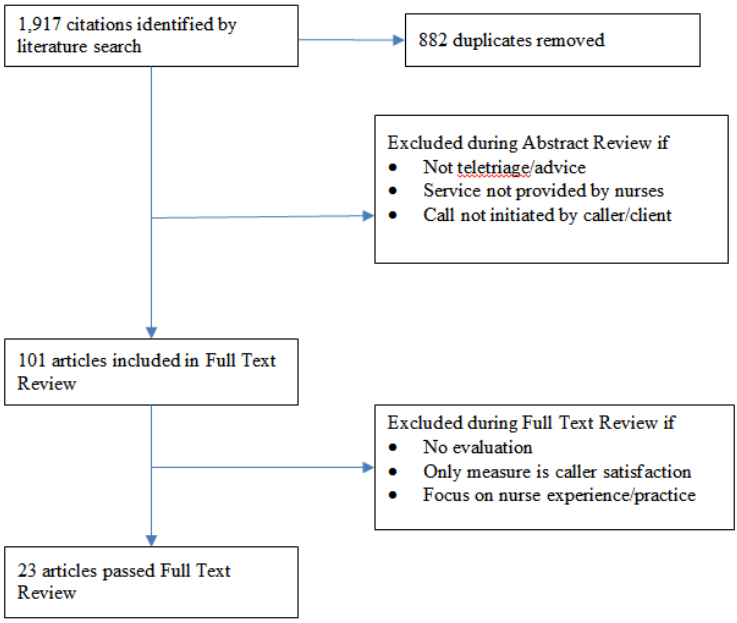

Figure 1. Article Search Diagram.

5. Results

5.1. Evidence of Cost Savings

Most of the articles are using cost analysis, i.e. comparing the cost of the call service with various face-to-face services. In a study at the Denver Health NurseLine, Bogdan et al compared the cost of the caller's original intent for care with the cost of the nurse's recommendation and the cost of the caller's action. During the study period nurse recommendations represented a saving of $26,400, or 28%, over the cost that would have been generated if the callers had not used the teletriage service. The callers' final actions in accessing care still led to savings of $14,568, or 15.5%. Extrapolating this figure to the 30,000 calls the NurseLine receives in a year, the telenursing service could save the healthcare system roughly $1.6 million. The annual cost for the service is less than $650,000 for net savings of roughly $1 million. [6]. Marklund et al found similar results

in a Swedish study with an average cost saving of €22.20/call. With roughly 25,000 calls per year, savings could reach €1 million. The cost of the service is not given, but it is implied that the €22.20 are net savings per call. [7] Both these services are open to the general public and staffed with generalist nurses.

Navratil-Strawn et al calculate the Return on Investment (ROI) at the Nurse HealthLine available to customers of a US insurance company. The service provides triage and advice. The study took place over a 12 month period; the researchers compared each caller's pre-call intention, nurse recommendations and actual services. Claims data were used to measure caller adherence. The cost for the program was calculated at $8.7 million, while savings were calculated at $13.8 million, for an ROI of 1.59 [8].O'Connor evaluated a specialist service for callers with inflammatory bowel disease in the UK over two 12-months periods (April 2008-March 2009/April 2009-March 2010). The author notes that 85%/80% of calls were resolved over the telephone; 14.9%/19% of callers required outpatient appointments, and <0.1%/<1% were admitted to hospital. The cost for the various services is £5.64 per call, £20.00 for a doctor's appointment, £87.00 for hospital follow-up, and £87.00 to 117.00 for an emergency department visit [9]. Evans (2012) and Roberts (2008) calculate cost savings by comparing the cost of the service with the cost of admission to acute care. Evans discusses the Elsie Bertram Diabetes Centre where 50% of patient contact is over the phone. The phone helpline is staffed with Diabetes Specialist Nurses. During the study period of November 01, 2008 to Oct 31,2009, there were 5703 phone consultations. 95% of these calls were dealt with by phone alone. The cost per call is calculated at £23 while the cost of admission for hyper- or hypoglycemic episodes ranges from £846 to £2634 [10].Roberts describes a COPD hotline in Western Australia. Over the two year study period the hotline was used by 118 callers with between 1 and 20 calls each for a total of 675 calls. The annual cost of the hotline is $20,040 while an admission for COPD exacerbation averages $4,000. During the study period, 78 ambulance calls were averted, and the patients' individual action plan was activated 117 times. Roberts speculates these callers might have ended up in hospital without the hotline [11].

Spaulding reports on the Minnesota flu hotline that was established to deal with the high volume of people with symptoms or concerns about the H1N1 pandemic. Spaulding compares the cost of a call with the cost of face-to-face healthcare: $12 per call vs. $192 for a clinic visit, $269 for urgent care, and $876 for an emergency department visit [12].North et al calculate savings at Ask Mayo Clinic by comparing the callers' pre-call intent with the nurses' recommendations for callers who were later diagnosed with appendicitis. Although in these cases the nurses' recommendations were generally for a higher level of care than the caller's pre-call intent, savings were generated by having callers with appendicitis seen in a more timely fashion which prevented potential complications. The total charge for treatment of perforated appendicitis is $40,000 [13].

5.2. Citizens Accessing more Appropriate Levels of Care

3/23 articles discussed clinical appropriateness of the telenurses' advice. Snooks et al found 84% of recommendations to be clinically appropriate [14]; Singh et al: 95-96% [15]; and Marklund et al: 97.5% [7]. Where the advice was thought not to be clinically appropriate, it erred on the side of caution, i.e. the nurse's recommendation for care was considered too high.13/23 studies evaluate caller/client adherence to the nurse's recommendation. Light, De Coster, and Navratil-Strawn use insurance claims to verify if the client followed the nurse's recommendation about the level of care. Light et al look

at parents of febrile children who were given home care recommendations only. 74/110 parents had originally planned on a physician visit. After triage, 53/74 parents followed the nurse's home care advice. 29/110 parents were unsure what to do prior to the call. Following the call, 28/29 parents cared for their child in the home rather than seeking medical attention. 7/110 parents had already decided to care for their febrile child at home and were looking for home care advice from the nurse. In total, 80% of parents adhered to the nurse's home care recommendation [16].De Coster et al breaks down callers by demographic and symptom characteristics and finds that by demographics, uptake of the nurse's recommendation ranges from a low of 34.2% (client under 4 years of age; Health Care Provider [HCP] in 24h) to a high of 65.5% (client 50+ years of age; ED). Adherence by symptoms ranges from 27% (infant care, HCP in 24h) to 63.4% (cardiac; ED). There is little difference based on gender. Uptake for self-care recommendations is generally high and ranges from 74% to 89.2% [17]. Navratil-Strawn identifies similar adherence rates: 55% (2014) [8], and 57% (2014) [18]. Authors who relied on callers' self-reporting of adherence to nurse advice found rates ranging from 70% adherence [6] to 100% [16] – this latter specific to the recommendation of an emergency department visit. In a study of LINK Alberta, Williams et al found 87.5% of callers reported adherence to self-care recommendations [19].20/23 studies address resource use either by comparing pre-call intent and post-call intent, or using objective data such as insurance claims. Generally the authors who have described cost savings identify these savings as a result of callers seeking a lesser level of care than they had originally intended. Three authors that break down resource use into urban, suburban and rural areas, note that there are differences both in pre-call intent, nurse's recommendation, and final caller action: Hogenbirk et al [20], Dunt et al [21], and Navratil-Strawn et al [8]. Typically a range of medical services options is available in metropolitan areas, while in rural areas the local hospital may be the only option for face-to-face care. This may lead to a higher rate of accessing care in the emergency department, both as caller intent and nurse recommendation [21].Bolli et al found that the implementation of a nurse triage and advice line at a Swiss pediatric hospital led to an increase in ED visits, however the fact that parents called the nurseline before visiting the ED allowed for better planning of these outpatient visits and better workflow [22]. Wetta-Hall et al found that calls to a nurse triage and advice line led to decreases in ED visits, and while there was an increase in GP visits there was also an increase in self-care behaviour [23].

Some specialist services find that most caller concerns can be resolved over the phone. Reid and Porter report on a chemotherapy helpline in Northern Ireland, where fewer than half the calls require a face-to-face visit. Without the helpline, patients would have no choice but to visit their doctor for help in dealing with troublesome side effects [24]. Other specialist services with nurse helplines include a service for parents of children with congenital abnormalities (Gischler et al) [25], patients with movement disorders (Roberts-South et al) [26], and palliative patients cared for at home (Phillips et al [27] and Roberts et al [28]). These services have in common that they serve a small population with significant medical and care needs. Nurse helplines provide a first point of contact serve to resolve concerns and streamline access to face-to-face care. Determining if callers adhere to the nurses' recommendations can be difficult. Studies that use objective data i.e. insurance claims show lower adherence than those who rely on self-selected and self-reporting survey participants. Overall, reported adherence is greatest when the nurse's recommendation matches the caller's pre-call intent.

6. Discussion and Conclusion

Telenursing triage and advice services have the potential to save money and resources within the overall healthcare system. Current research that uses objective data such as insurance claims shows cost savings for the overall healthcare system, but there is not much of this type of research. Further research is needed to specifically identify callers' pre-call and post-call intent and actions. Since some callers had intended a lower level of care than was recommended by the nurse, or no care at all, these kinds of calls can lead to higher costs in the short term, but potentially to better clinical outcomes and cost savings in the long term, as described by North, where timely diagnosis of appendicitis allows for prompt treatment that is less costly than treatment of complications [13].The research on appropriateness of advice shows that the advice is clinically appropriate in 85-90% of cases, and where not considered appropriate, the recommendations are for a higher level of care rather than too low. Clinical decision support systems reflect the fact that nurses are unable to see their clients as well as not being able to collect objective health data and may recommend higher levels of care than a clinician would recommend in a face-to-face encounter. This review provides a limited scan on the impact telenursing triage and advice services have on the broader health care system. The focus is on costs and resource use, with lesser emphasis on health outcomes. It is important to recognize that theoretically these services could function as a barrier to accessing medical care, while the thrust should be towards client empowerment by sharing information to assist with appropriate health care choices. The studies that did track callers' pre- and post-intent of seeking care show a marked increase in self-care decisions following the call, but this also includes some callers who had not planned on any care for their symptoms. Lastly, it is difficult to compare cost benefits of telenursing services in different jurisdictions, as the overall health care systems differ substantially. However there is a scarcity of research even in jurisdictions that can be easily compared, e.g. Canadian provinces. In order to justify expansion of telenursing triage and advice services it is imperative to conduct more standardized studies in various jurisdictions, using objective data whenever possible, and comparing health outcomes as well as program costs. In summary studies from various jurisdictions have shown a decrease in ED and GP visits as well as cost savings following the use of a nurse triage and advice line. There is great variety because of variances in healthcare jurisdictions, as well as variances in study parameters and cost calculations. More research in more settings is needed to show consistent benefit from telenurse triage and advice services.

References

[1] Spending on Health: Latest Trends. http://www.oecd.org/health/health-systems/Health-Spending-Latest-Trends-Brief.pdf (retrieved Sep. 7, 2018).
[2] National Health Expenditure Trends, 1975 to 2017.https://www.cihi.ca/sites/default/files/document/nacrs-2016-2017-qs-static-table-en.xlsx(retrieved Sep. 07, 2018)
[3] Health Fact Sheets Primary Health Care Providers (2016) Statistics Canada - https://www150.statcan.gc.ca/n1/pub/82-625-x/2017001/article/54863-eng.htm (retrieved Sep. 07, 2018)
[4] Canadian Telehealth Report. https://livecare.ca/sites/default/files/2015%20TeleHealth-Public-eBook-Final-10-9-15-secured.pdf (retrieved Sep. 07, 2018)
[5] H.Arksey& L.O'Malley, Scoping studies: Towards a methodological framework,*Int J Soc Research Method*, **8(1)**(2005), 19-32.

[6] G. M. Bogdan, J. L.Green, D.Swanson, P. Gabow, &R.C. Dart, Evaluating patient compliance with nurse advice line recommendations and the impact on healthcare costs, *Amer J Managed Care*, **10(8)** (2004), 534-542.
[7] B. Marklund, M. Ström, J. Mänson, L. Borgquist, A. Baigi, & B. Fridlund, Computer-supported telephone nurse triage: An evaluation of medical quality and costs,*JNurs Manage***15(2)** (2007), 180-187.
[8] J.L. Navratil-Strawn , K. Hawkins, T.S. Wells, R.J. Ozminkowski, J. Hawkins-Koch, H. Chan, S.K. Hartley, R.J. Migliori& C.S. Yeh, Listening to the nurse pays off: An integrated Nurse HealthLineprogramme was associated with significant cost savings, *J Nurs Manage* **22** (2014), 837–847.
[9] M. O'Connor, Criteria for success using an inflammatory bowel disease nurse telephone service. *Gastrointestinal Nurs* **9(2)** (2011), 36-42.
[10] N.Evans, L. Richardson, K.Dhatariya& M.Sampson, Diabetes specialist nurse telemedicine: admissions avoidance, costs and casemix, *EuroDiabNurs***9(1)** (2012), 17-21.
[11] M. Roberts, S. Leeder & T. Robinson, Nurse-led 24-h hotline for patients with chronic obstructive pulmonary disease reduces hospital use and is safe. *Internal Med J***38(5)** (2008), 334-340.
[12] A.B. Spaulding, D.Radi, H. Macleod, R.Lynfield, M. Larson, T.Hyduke, P. Dehnel&A.S. DeVries, Satisfaction and public health cost of a statewide influenza nurse triage line in response to pandemic H1N1 influenza. *PloS one*, **8(1)** (2013), e50492.
[13] F. North, O.Olufunso&V. Prathibha, The value of telephone triage for patients with appendicitis, *JTelemedTelecare***17(8)** (2011): 417-420.
[14] H. Snooks, J.Peconi, J. Munro, W.Y. Cheung, J. Rance&A. Williams, An evaluation of the appropriateness of advice and healthcare contacts made following calls to NHS Direct Wales. *BMC Health ServResearch*, **9(1)** (2009), 178.
[15] K. Singh &C. Warnock, Assessing the value of a nurseled telephone advice and triage service. *Cancer NursPract*, **12(4)** (2013), 30-35.
[16] P.A. Light, J.Hupcey&M.B. Clark, Nursing telephone triage and its influence on parents' choice of care for febrile children. *J Pediatric Nursing*, **20(6)** (2005), 424-429.
[17] C. De Coster, H. Quan, R. Elford, B. Li, L. Mazzei& S. Zimmer, Follow-through after calling a nurse telephone advice line: a population-based study. *Family Practice*, **27** (2010), 271–278.
[18] J.L. Navratil-Strawn, R.J. Ozminkowski&S.K. Hartley, An economic analysis of a nurse-led telephone triage service. *J TelemedTelecare*, **20(6)** (2014), 330-338
[19] B. Williams, S. Warren, R. McKim& W. Janzen, Caller self-care decisions following teletriage advice. *J ClinNurs*, **21(7/8)** (2012), 1041-1050.
[20] J.C. Hogenbirk, R.W. Pong,& S. K. Lemieux, Impact of telephone triage on medical service use: implications for rural and remote areas. *J AgriculturalSafety andHealth*, **11(2)** (2005), 229-37.
[21] D. Dunt, R. Wilson, S.E. Day, M.Kelaher, &L. Gurrin, Impact of telephone triage on emergency after hours GP Medicare usage: a time-series analysis. *Aust New Zealand Health Policy,***4(1)** (2007), 21.
[22] S. Bolli, G. Melle&B. Laubscher, After-hours paediatric telephone triage and advice: the Neuchâtel experience. *Euro J Ped***164(9)** (2005), 568-572.
[23] R. Wetta-Hall, G.M. Berg-Copas&S.E. Dismuke, (2005). Help on the Line: Telephone-Triage Use, Outcomes, and Satisfaction Within an Uninsured Population. *Eval Health Prof*, **28(4)** (2005), 414-427.
[24] J. Reid &S. Porter, Utility, caller, and patient profile of a novel chemotherapy telephone helpline service within a regional cancer centre in Northern Ireland. *Cancer Nurs***34(3)** (2011), E27-E32.
[25] S. Gischler, P. Mazer, M. Poley, D. Tibboel&M. van Dijk, Telephone helpline for parents of children with congenital anomalies. *J AdvNurs***64(6)** (2008), 625-631.
[26] A. Roberts-South, L. Hall&M.S. Jog, Telehealth Management in Movement Disorder: A retrospective study. *Canadian J Neurological Sci* 40(2) (2013), 230-234.
[27] J.L. Phillips, P.M. Davidson, P.J. Newton&M. DiGiacomo, Supporting patients and their caregivers after-hours at the end of life: The role of telephone support. *J Pain Symptom Manage* **36(1)** (2008), 11-21.
[28] D. Roberts, C. Tayler, D. MacCormack&D. Barwich, Telenursing in hospice palliative care. *The Can Nurs*, **103(5)** (2007), 24.