User Centred Networked Health Care
A. Moen et al. (Eds.)
IOS Press, 2011

doi:10.3233/978-1-60750-806-9-407

Evaluation of Telephone Triage and Advice Services: a Systematic Review on Methods, Metrics and Results

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Abstract. Telephone triage and advice services (TTAS) have been increasingly used to assess patients' symptoms, provide information and refer patients to appropriate levels of care (attempting to pursue efficiency and quality of care gains while ensuring safety). However, previous reviews have pointed out for the need for adequately evaluating TTAS. AIMS: To review TTAS evaluation studies, compile methodologies and metrics used and compare results. Systematic search in PubMed database; data collection and categorization by TTAS features and context, type of evaluation, methods, metrics and results; critical assessment of studies; discussion on research needs. 395 articles screened, 55 of them included in the analysis. In conclusion, several aspects of TTAS impact on healthcare systems remain unclear either due to a lack of research (e.g. on long term clinical outcomes, clinical pathways, safety, enhanced access) or because of huge disparities in existing studies on the accuracy of advice, patient compliance, system use, satisfaction and economic evaluation. Further research on TTAS impact is required, comprising multiple perspectives and broad range of metrics.

Keywords. Teletriage, e-health, health technology assessment, health services research, economic evaluation, systematic review.

1. Introduction

In recent years telephone triage and advice services (TTAS) have been introduced to improve delivery of healthcare services. TTAS are e-health services that combine the use of call centre technology with formal or informal clinical decision systems to evaluate patients' health condition and advise them or their caregivers to act accordingly. Major objectives pursued by TTAS are to provide education to patients, reducing the fear caused by unknown conditions and empowering to self-care, and to direct patients to appropriate levels of care, increasing the efficiency of healthcare systems and promoting safety and access to care. Although several studies on the impact of TTAS have been conducted, systematic reviews have found flaws in available literature and indicated the need for further studying the impact of teletriage on healthcare systems' use, safety, cost and on patient satisfaction [1,2]. This study provides a systematic review of evidence about TTAS' impact on healthcare systems

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and about the methods and metrics used in these studies[2], so as to analyze quality and results from previous studies, as well as to define future research needs.

2. Methods

Papers were selected from the PubMed database[3] using the keywords listed in Table 1, line 1, which encompass different terminologies associated with TTAS. Other terms like 'telephone counseling', 'counseling call centre', 'counseling line', 'consultation call centre', 'helpline' and 'hotline' were excluded from search because they are mostly associated with specific medical problems' advice or with follow-up or self support services. Results were successively filtered to: (a) retrieve only evaluation studies (Table 1, line 2); (b) retrieve papers including evaluation from the viewpoint of the healthcare system (line 4); and (c) retrieve papers published from 1994 to present (line 6). The search was run in October 18 2010. All articles retrieved were screened by the first author using title and abstract information, and those outside the scope of this study were excluded. Ambiguous cases were discussed with the remaining authors to achieve a consensus.

Table 1. PubMed database search strategy

	Search Strategy
1.	(teletriage OR telephone triage OR telephone consultation OR NHS Direct OR telephone advice OR tele-advice OR health call centre OR (nurs* AND call centre) OR triage call centre OR (consul* AND call centre) OR (after-hours AND call centre) OR triage line OR advice line OR (telephone-based AND triage)[Title/Abstract]
2.	(impact OR assess* OR effect* OR evaluat* OR econom*)[All Fields]
3.	#1 AND #2
4.	(hospital OR visit* OR pathway* OR emergency* OR referral OR utilization)[All Fields]
5.	#3 AND #4
6.	"1995"[PDAT] : "3000"[PDAT]) AND "0"[PDAT] : "3000"[PDAT]
7.	#5 AND #6

Each study was classified according to: Context and Features of TTAS, Objective, Perspective of analysis, Type of economic evaluation, Metrics, Design and Results. Type of economic evaluation category applied the definitions suggested by Drummond et al. [3]. Study design was compiled using the terms and definitions of INHTA Health Technology Assessment (HTA) [4] and The Cochrane Collaboration [5] glossaries. Metrics were grouped by: A. Accuracy of advice; B. Patient compliance to advice; C. Output: C1. Access to care; C2. System use; C3. Clinical outcomes; C4. Safety; C5. Satisfaction; C6. Economics. One should note that a meta-analysis was considered inappropriate because of a large heterogeneity in methods, metrics and context of TTAS studies. Critical assessment of evaluation studies used a modified version of "a check-list for assessing economic evaluation" proposed by Drummond et al. [3] that best fits partial economic evaluations assessing: objective clearness, alternatives adequacy, potential bias, costs and outcomes completeness, data sources, uncertainty allowance and generalizability.

[2] Both teletriage and tele-advice by health professionals in their routine work with their patients and teletriage services restricted to one specific disease or telephone advice services for self support (ex. tobacco cessation helpline) are outside the scope of this study.

[3] http://www.ncbi.nml.nih.gov/pubmed

3. Results

Figure 1 shows search and screening results. 55 papers were included in our review, of which 50 are original studies. A reference list of these papers is accessible from the website http://echo.fe.ucp.pt/~189903001/index_files/ttas1.html.

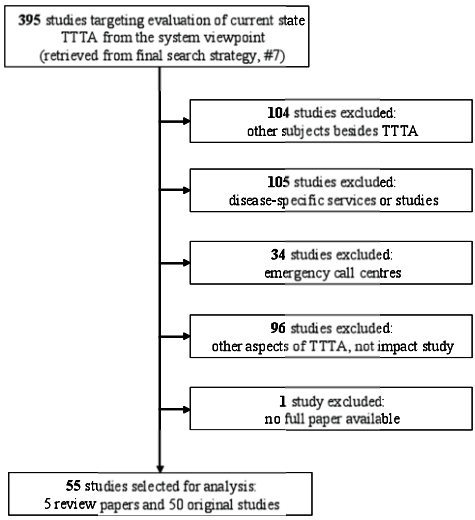

Figure 1. Flowchart of selection process and results

Context and Features. 24 of the original studies concern stand alone centralized TTAS, 22 concern TTAS embedded in healthcare delivery units, and the remaining 4 compare different organization models. Most studies report services provided in the UK and USA, some in Australia and few in other countries - Canada, New Zealand, Netherlands, Denmark, Switzerland, France and Japan. 20 studies evaluate 24-hours TTAS services, 18 evaluate TTAS for management of out-of-hours care and the remaining 6 for in-hours care. Most studies relate to TTAS provided to populations of all ages, still 20% relate to pediatric TTAS. Most studies address TTAS provided by nurses supported by computerized systems with embedded protocols and algorithms. Regarding the maturity of the service, 20 studies evaluate services established over three years, 18 evaluate services with three or less years of operation and 18 evaluate pilot experiences.

Objective and perspective of analysis. Almost all studies clearly state their objectives, aiming at assessing the impact of TTAS on identified issues or metrics. Many studies do not explicitly state the perspective of analysis (although that can be inferred): the perspective of the system is adopted in most studies, of the provider in some studies, and of patients or professionals in a few studies.

Type of economic evaluation. 16 of the 50 original studies do not perform an analysis of alternatives (15 are consequence description studies and one is a cost-outcome description). 25 studies are efficacy or effectiveness studies (comparing consequences of alternatives). Only 9 studies assess both costs and consequences of alternatives, although some do not present an overall index or ratio of costs to consequences. Many of the studies comparing alternatives do not use an independent concurrent control but rather a “do nothing alternative” obtained either from “patient intention if the TTAS did not exist” or from “before” data in pre-post designs. Others use a control defined by patients using health care providers who did not contacted previously TTAS, or who live in areas where TTAS is not available. Only 4 studies randomize patients to receive or not care through TTAS.

Study design. 30 studies are retrospective and 20 prospective. Almost all studies included quantitative assessments, only 2 qualitative studies and 18 observational studies, 31 experimental and 1 decision analysis study. 33 studies do not use an independent control group. Concerning sampling, 14 studies use total/population data, 14 use a randomized sample and 15 use a convenience non-random sample.

Metrics and results. Table 2 presents a summary of main metrics, frequent instruments for data collection and key findings for each type of metric.

Table 2. Summary of findings for most used metrics, strategies and results for each type of metric (Tm)

Tm	Metrics	Data Collection Strategies	Analysis of Results
A	Adequacy of the advised level of care.	Audits to real or simulated calls; Assessment of medical record when patients present to providers (with or without control).	Unable to demonstrate high rates of advice appropriateness or service use adequacy gains when compared with control.
B	Patient compliance to present to level of care advised.	Self-reported through survey; Determined through providers databases.	Varies according recommendation and is affected by other factors (intention, complaint, age, income); Is higher when measured from self-reported data comparing with provider's database matching and is affected by the time window in metric definition.
C1	Enhanced access to care.	Self-reported through survey; Analyzed from operations data.	Not always improved, depending on the considered indicators and system context; Reports of expedited access to hospital for patients with serious symptoms.
C2	Change in rates or tends of services use. Changes in professionals' workload.	Determined from difference between self-reported intention and action after TTAS (self-reported or checked from providers' data); Determined from services' use trend analysis with or without control (before-and-after); Randomized Controlled Trial (few).	TTAS usually promptly reduces medical workload but remains unclear whether it only delays it; Evidence on the impact on primary care or emergency department use is diverse; Relevance of influence factors such as: TTAS use rate, geographic location (urban vs. rural) and TTAS organization (central or embedded).
C3	Adverse events (deaths, ED, admissions); Delayed care.	Patients survey; Medical record after service use.	Safety is a concern for both patients and professionals; Few adverse events with death reported; Rates of unadvised significant care between 4% and 10%.
C4	Clinical Outcomes after TTAS.	Self-reported through patients' survey.	No studies on long-term clinical outcomes; Some cases resolve with TTAS, others improve, others require additional care.
C5	Patient satisfaction in Likert scales.	Self-reported from survey.	Most studies report high levels of satisfaction (non controlled measure); There are reports of low satisfaction with TTAS when it constitutes a barrier to traditional care (e.g. home visits).
C6	Savings from avoided services' use; TTAS costs.	Analysis derived from system use impact studies.	Most studies suggest the existence of net benefits from TTAS, but others conclude TTAS does not reduce overall costs; Some studies do not account for follow-up costs and those who do it use different time windows. Some studies use non robust data of service use avoidance. No study evaluated all relevant benefits and costs and all relevant perspectives.

4. Discussion

In line with previous studies [1, 2], results from our review indicate that many aspects of TTAS impact on healthcare systems remain unclear, and further research is needed.

Several studies have analyzed the accuracy of advice and the impact on services' use, but the dispersion of results suggests that it is important to further study TTAS features and context as determinants of success and to overcome inconsistencies in the definition of evaluation metrics and in the choice of evaluation methods, which greatly affect the generalization of results. Most studies report experiences of TTAS in the UK, USA and to a less extent in Australia, remaining unknown whether TTAS has been adopted and/or evaluated in other healthcare systems.

Impact on long term clinical outcomes and safety are areas where few results were found - most studies tend to focus on the type of advice given to patients. More research is needed to consider impacts for both patients and professionals.

Concerning economic evaluations of TTAS, no study considered a broad range of impacts (e.g. follow-up costs/savings, costs/savings from anticipated/delayed care or adverse events' rate change, value of recommendations for people, patient clinical pathways), nor all relevant perspectives (e.g. patients perspective was rarely studied). Future evaluation studies of TTAS should attempt to address multiple perspectives and impacts, as well as consider the deployment of multiple organizational strategies within TTAS. Methodologies combining multiple designs and data sources, or using decision analytic modeling could be essayed to achieve these goals.

Available evidence suggests that TTAS might be reasonably safe, although advice accuracy rates are not high. It still remains unclear if TTAS promotes access to care, services' use adequacy, or system efficiency and which are the organization models that enhance TTAS potential gains.

5. Conclusions

Further research on TTAS impact is required, comprising multiple perspectives, broad range of metrics and complete care process (from initial call to problem resolution), including clinical pathways and clinical outcomes.

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