Evaluation of telephone triage and advice services: a systematic review on methods, metrics and results

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Telephone triage and advice services (TTAS) are e-health services that combine the use of call centre technology with formal or informal clinical decision systems to evaluate patients’ acute health conditions and advise them or their caregivers to act accordingly helping to adequate the demand for healthcare services to actual patient needs.
Aims of the study

• review and summarize evidence about TTAS’ impact on healthcare systems
• analyze
  – methods and metrics used
  – studies’ quality
  – results
• define future research needs
Methods

1. Terms selection
   from terminologies associated with TTAS; Terms mostly associated with specific medical problems’ advice or with follow-up or self support services were excluded: ‘telephone counseling’, ‘counseling call centre’, ‘counseling line’, ‘consultation call centre’, ‘helpline’ and ‘hotline’

2. Filters definition
   to retrieve:
   • evaluation studies
   • evaluations from the viewpoint of the healthcare system
   • papers published from 1995 to present

3. Search in PubMed database

4. Screening
   using title and abstract information to exclude papers outside the scope

<table>
<thead>
<tr>
<th>Search Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
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<td>5</td>
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<tr>
<td>6</td>
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<td>7</td>
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</tbody>
</table>
Methods (Cont.)

5. Full paper analysis, data collection and categorization

Context
- Country;
- Organization model: stand alone, embedded in healthcare delivery units;

Features
- Availability: 24-hours, out-of-hours or in-hours;
- Patients: pediatric, adult or all ages;
- Professionals: nurses, physicians, both, others;
- Technologies: protocols, computerized, access to EMR;
- Maturity: established over 3 years, 3 or less years of operation, pilot;

Methods
- Viewpoint of the analysis
- Type of evaluation following Drummond et al. (1)
- Study design using the terms and definitions of INHTA Health Technology Assessment (HTA) (2) and The Cochrane Collaboration (3) glossaries

Metrics
- A. Accuracy of advice;
- B. Patient compliance to advice;
- C. Impact on:
  - C1. Access to care;
  - C2. System use;
  - C3. Clinical outcomes;
  - C4. Safety;
  - C5. Satisfaction;

a meta-analysis was considered inappropriate due to large heterogeneity in methods, metrics and context of TTAS studies

6. Critical assessment of studies
- modified version of “a check-list for assessing economic evaluation” proposed by Drummond et al. (1)

7. Discussion on research needs
Results – searching and screening

395 studies targeting evaluation of current state TTTA from the system viewpoint (retrieved from final search strategy, #7)

104 studies excluded: other subjects besides TTTA

105 studies excluded: disease-specific services or studies

34 studies excluded: emergency call centres

96 studies excluded: other aspects of TTTA, not impact study

1 study excluded: no full paper available

55 studies selected for analysis: 5 review papers and 50 original studies

A reference list of these papers is accessible from the website http://echo.fe.ucp.pt/~189903001/index_files/ttas1
### Results - methods

#### Study design
- Almost all quantitative studies (only 2 qualitative studies)
- 30 retrospective studies and 20 prospective studies
- 18 observational studies, 31 experimental and 1 decision analysis study
- Only 17 studies with independent control group
- 14 population studies, 14 use a randomized sample and 15 a convenience nonrandom sample

#### Type of economic evaluation

<table>
<thead>
<tr>
<th>BOTH COSTS AND CONSEQUENCES EXAMINED?</th>
<th>NO</th>
<th>ONLY CONSEQUENCES</th>
<th>ONLY COSTS</th>
<th>YES</th>
<th>COSTS AND CONSEQUENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPARISON OF ALTERNATIVES?</td>
<td>NO</td>
<td>OUTCOME DESCRIPTION 15 studies</td>
<td>COST DESCRIPTION</td>
<td>YES</td>
<td>COST-O UTE DESCRIPTION 1 study</td>
</tr>
<tr>
<td></td>
<td>YES</td>
<td>EFFICACY OR EFFICIENCY ANALYSIS 25 studies</td>
<td>COST ANALYSIS</td>
<td>FULL ECONOMIC EVALUATION (CEA, CUA OR CBA) 9 studies</td>
<td></td>
</tr>
</tbody>
</table>
## Results - metrics

### Example of analysis table – C.4. Safety (parcial)

<table>
<thead>
<tr>
<th>Study</th>
<th>Metric</th>
<th>Context</th>
<th>Design</th>
<th>Control</th>
<th>Sample size</th>
<th>Results</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maeda et al, 2009 [4]</td>
<td>Nr. of semi-urgent cases that did not receive attention</td>
<td>CPN+PTTAS</td>
<td>Decision analysis model with data from references</td>
<td>Standard care (not using TTAS)</td>
<td>Basic analysis run for 10,000 after hours of which 1482 are semi-urgent cases and assuming 10% of non-urgent cases call TTAS (973 calls)</td>
<td>Small difference in the nr. of semi-urgent cases that did not receive attention (3/1,000; 137 vs 134).</td>
<td>Professionals and patients showed concern about incorrect diagnosis. There are also concerns about patients may not understand or remember advice. For clinicians, loss of visual cues (which help to establish quickly who may be serious ill) is the major drawback of TTAS. Patients are afraid of failing to describe symptoms adequately and loss of body-language cues.</td>
</tr>
<tr>
<td>McKinstry et al, 2009 [5]</td>
<td>Safety concerns of patients and professionals</td>
<td>PCEPTAS</td>
<td>Focus group + national questionnaire</td>
<td>Face to face consultations</td>
<td>Focus Group: N=91 (25 GP + 14 nurses + 19 Admin staff + 33 patients) arranged in 15 focus groups. Surveys: 582 (39% of 1510) responses (105 GP, 107 nurses, 143 admin staff and 227 patients)</td>
<td>Professionals and patients showed concern about incorrect diagnosis. There are also concerns about patients may not understand or remember advice. For clinicians, loss of visual cues (which help to establish quickly who may be serious ill) is the major drawback of TTAS. Patients are afraid of failing to describe symptoms adequately and loss of body-language cues.</td>
<td>• Methodology itself (simulation) • Possible bias: shortage of data. Model derived from a discussion with 2 pediatricians and 2 clinical epidemiologists • Pediatric restricted context</td>
</tr>
<tr>
<td>Hildebrandt et al, 2006 [14]</td>
<td>Harm arising from phone calls not being forwarded by answering services to the on-call physician (from outcomes review and coded into 6-point harm scale by a team of trained coders)</td>
<td>PEPTAS with centralized answering service</td>
<td>Observational non randomized non controlled study based on medical records review</td>
<td>--</td>
<td>41% (119 of 288) of calls not forwarded to on-call physician because patient do not consider it an emergency (of total 1 year 2835 after-hours clinical calls)</td>
<td>2.5% patients suffered clinical harm, 1.7% were in risk of future harm and 26% suffered discomfort. Harm occurs when patients’ calls are not forwarded to on-call physician</td>
<td>• small potential influence of the researchers’ background in FG; • low rate response in triangulation questionnaire</td>
</tr>
<tr>
<td>Labarère et al, 2003 [34]</td>
<td>Nr of Adverse Events</td>
<td>EEPTAS</td>
<td>Cross-sectional randomized study based on telephone survey to callers and data from ED</td>
<td>--</td>
<td>409 callers (of 3852 eligible calls during 1 month)</td>
<td>• 1 subject (0.2%) advised to self-care died at home • 12 patients of the 125 (9.6%) patients advised to consult a GP were subsequently sent to an ED. Moreover, 7 of the 69 (10.1%) who did not follow advice to self-care and went to GP were also sent to an ED</td>
<td>• Source of data is from self-reported action which may be inaccurate • A large part of AAE could be unknown because of a lack of feedback</td>
</tr>
</tbody>
</table>

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**Note:** This table is a partial example and the full analysis includes additional studies and detailed metrics.
# Results – accuracy of advice and patient compliance to advice

<table>
<thead>
<tr>
<th>Type of metric</th>
<th># studies</th>
<th>Metrics</th>
<th>Strategies</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Accuracy of advice</td>
<td>12</td>
<td>Adequacy of the advised level of care</td>
<td>Audits to real or simulated calls; Assessment of medical record when patients present to providers (with or without control).</td>
<td>Unable to demonstrate high rates of advice appropriateness or service use adequacy gains when compared with control</td>
</tr>
<tr>
<td>B. Patient compliance to advice</td>
<td>15</td>
<td>Patient compliance to present to level of care advised</td>
<td>Self-reported through survey; Determined through providers databases</td>
<td>Varies according recommendation and is affected complaint, age, income); <strong>Affected by collection strategy</strong>: higher when measured from self-reported data comparing with provider’s database matching and is affected by the time window in metric definition</td>
</tr>
</tbody>
</table>
## Evaluation of telephone triage and advice services: a systematic review on methods, metrics and results

<table>
<thead>
<tr>
<th>Type of metric</th>
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<th>Metrics</th>
<th>Strategies</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.1. Access to care</td>
<td>4</td>
<td>Enhanced access to care survey; Analyzed from operations data</td>
<td>survey; Reports of expedited access to hospital for patients with serious symptoms</td>
<td>Reports of expedited access to hospital for patients with serious symptoms</td>
</tr>
<tr>
<td>C.2. System use</td>
<td>27</td>
<td>Changes in professionals’ Workload reported or checked from providers’ data; Determined from services’ use trend analysis with or without control (before-and-after); Randomized Controlled Trial (few).</td>
<td>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)</td>
<td></td>
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</tbody>
</table>
Results – impact on safety, clinical outcomes and satisfaction

<table>
<thead>
<tr>
<th>Type of metric</th>
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<th>Strategies</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.3. Safety</td>
<td>7</td>
<td>Adverse events (deaths, ED, admissions); Delayed care</td>
<td>Patients survey; Medical record after service use</td>
<td>Safety is a concern for both patients and professionals; Few adverse events with death reported; Rates of unadvised significant care between 4% and 10%.</td>
</tr>
<tr>
<td>C.4. Clinical outcomes</td>
<td>4</td>
<td>Clinical Outcomes after TTAS</td>
<td>Self-reported through patients’ survey</td>
<td>No studies on long-term clinical outcomes; Some cases resolve with TTAS, others improve, others require additional care</td>
</tr>
<tr>
<td>C.5. Satisfaction</td>
<td>14</td>
<td>Patient satisfaction in Likert scales</td>
<td>Self-reported through survey; Analyzed from operations data</td>
<td>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)</td>
</tr>
</tbody>
</table>
## Results – impact on economics

<table>
<thead>
<tr>
<th>Type of metric</th>
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<th>Metrics</th>
<th>Strategies</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.6. Economics</td>
<td>11</td>
<td>Savings from avoided services’ use; TTAS costs</td>
<td>Analysis derived from system use impact studies</td>
<td><strong>Most studies</strong> suggest the existence of <strong>net benefits</strong> 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 perspective</td>
</tr>
</tbody>
</table>
Critical assessment

• Found several limitations
  – Few studies on impact on access, clinical outcomes and safety
  – Few complete economic evaluations
  – Few studies with multiple methods and data sources and usually limitations when using only one approach
  – Limited external validity and great heterogeneity of metrics
  – Many studies do not perform an analysis of alternatives
  – Many of the studies comparing alternatives do not use an independent concurrent control
  – Few studies randomize patients to receive or not TTAS
  – Some studies do not clearly state their objectives or perspective of analysis
Conclusions

• Many aspects of TTAS impact on healthcare systems remain unclear
• Further research on TTAS impact is required comprising
  – combining multiple designs and data sources
  – broad range of metrics
  – complete care process (from initial call to problem resolution) including clinical pathways and clinical outcomes
  – multiple perspectives
Thank you for your attention

• References


(3) Glossary of Terms in The Cochrane Collaboration, version 4.2.5, The Cochrane Collaboration, 2005

(4) Reference list of papers included in the review available at: http://echo.fe.ucp.pt/~189903001/index_files/ttas1

• Thanks to

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