Health Technology Assessment in nursing: a literature review

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Background: The Health Technology Assessment (HTA) approach, which provides scientific support for the decisions taken within the health field, is of increasing importance worldwide. In a context of limited resources, HTA has the potential of being an efficient tool for addressing the sustainability problems and the allocation choices arising from the constant increase in demand.

Aim: This study aims to investigate HTA use in nursing, both in terms of quantifying HTA evaluations of nursing phenomena which have been conducted and in terms of the extent to which nursing has used the HTA approach. The Italian context has been analysed because of the growing diffusion of the HTA in Italy along with the recent developments in the nursing profession.

Methods: A narrative review of international literature was undertaken using the following databases: HTA, PubMed, CINAHL, ILISI.

Results: Seventy evaluation studies on nursing were identified from the HTA database (1.12% of all studies in the database). The areas of nursing intervention and the country of origin of the studies were identified. Two nursing studies on the HTA approach were found in the PubMed, CINAHL and HTA databases. The first focused on the evaluation of nursing technology process and analysed 126 studies in six main thematic areas; the second was a systematic review on HTA in nursing and analysed 192 studies (46 meta-analyses, 31 Finnish primary studies, 117 international primary studies). Three Italian studies were identified from the ILISI database and Italian grey literature.

Discussion: In the international literature, although analyses regarding the efficacy of nursing interventions have been conducted, there are to date very few research projects that focus exclusively on the HTA process as applied to nursing. The recent development of a standardized nursing language coupled with the open debate as to which research method (qualitative vs. quantitative) best serves to ‘read’ nursing phenomena may explain the scarce diffusion of HTA in the field of nursing.

Keywords: Heath Technology Assessment, HTA, Nursing, Italy

Background

The 21st century health care faces a number of new challenges: the exponential increase in demand and the explosion of needs that grow faster than does the availability of resources despite the increased investments in the healthcare sector on the part of all industrialized countries.
Healthcare systems around the world are currently called upon to address three relevant problems: firstly, the changing social and health problems connected with social and demographic transition, epidemiological problems and problems connected with the provision of health care; secondly, there are growing expectations on the part of the users, strongly influenced by the media, and the phenomenon of consumerism which ‘changes’ the patient into a demanding client; and thirdly, the uncontrolled technological expansion upheld by a highly profitable ‘health market’, which has a strong influence on both the supply and the demand of services.

The decision-makers involved in healthcare politics must address these emerging problems. They must ensure the availability of high-quality, innovative health care, while, on one hand, managing the budgets and, on the other hand, ensuring equality of access and self-determination in the choice of treatment for the users (Goodman 2004).

Evaluating the appropriate application of technologies adopted in health care, diagnostic and therapeutic procedures, as well as the organizational models followed, is fundamental for an appropriate resource allocation (Mussa & Poppa 2009). This is a ‘categorical imperative’ for the decision-makers in the healthcare field, especially in the context of a worldwide, economic crisis.

A possible tool for this problem comes from the area of research known as the Health Technology Assessment (HTA).

It must be noted that health technologies refer not only to ‘material’ elements (biomedical instruments, devices, medicines, etc.), which play such an important role in producing health, but also to non-material elements (clinical procedures, organizational models, prevention programmes and health promotion programmes), without which healthcare action would not be possible.

The HTA aims to provide scientific support for the decision-makers so that they may base their decisions on the best available scientific evidence and understand the medical, social, economic, ethical and legal implications connected with the adoption of technological aids (understood in their broader sense: medicines, medical devices, biomedical equipment, procedures and services) within the healthcare systems and health facilities (Battista & Hodge 1995).

Aim
The aim of this research is to investigate the HTA use in nursing, both in terms of quantifying the HTA evaluations of nursing phenomena which have been conducted and in terms of the extent to which nursing has used the HTA approach. The growing diffusion of HTA in Italy (Favaretti et al. 2009), along with the recent developments in the nursing profession in this country, suggested a focus on the Italian context in which the author exercises his profession also in order to evaluate the potential for applying the HTA method to the field of Italian nursing.

Methods
Search strategy
In May 2011, a preliminary research of the international literature on the subject of this study was conducted in the PubMed, CINAHL and HTA databases. The search terms included HTA, HTCA, Health Technology Assessment, Health Care Technology Assessment and Nursing (MeSH). Terms were combined using the Boolean operators OR and AND. In the HTA database, the search term Nursing was used. A research of the grey literature was conducted utilizing Google Scholar. This preliminary study allowed for the fine tuning of the research subject as well as providing useful elements for carrying out the ‘facet analysis’.

Following this preliminary phase, three areas of research were developed. The first was conducted in the electronic HTA database (which is specific to HTA) and aimed to find all the HTA studies pertaining to nursing. Through the analysis of the studies found in the HTA database, the areas of nursing intervention studied internationally and the country of origin of the evaluation bodies were identified. A second area of research was carried out in the PubMed and CINAHL databases with the intention of investigating the nursing research projects that have analysed the application of the HTA in a professional setting. The third area of research regarding HTA as applied to Italian nursing was conducted by researching the Italian nursing scientific publications to obtain a picture of the Italian situation.

After defining the research hypothesis, the ‘facet analysis’ was carried out with the aim of broadening the field of research to obtain the biggest possible sample of articles on the utilization of the HTA process as applied to the field of nursing.

The choice of search terms and more precisely of the thesaurus entries (‘descriptive’ terms) used for the research was fundamental for searching the databases and obtaining the pertinent bibliography.

During the methodological planning of the research method with which to search the databases, searches by thesaurus, by fields and free searches were chosen. MeSH terms and free terms were thus combined in an attempt to maximize the sensitivity of the research. To increase the specificity of the search in the PubMed and CINAHL databases, the searches with the search terms was limited to the 'Title/Abstract' fields (i.e. the method known as ‘field searching’). The symbol ‘asterisk’ (*), also
known as 'truncation' which is adopted to signify all the letters of the English alphabet, was used to simplify and maximize the search results. To increase the specificity of the search in the CINAHL database, the proximity operators N1 and N2 were used for the free text searches composed of multiple search terms. In the PubMed database ‘search terms’ in inverted commas were used. The key words were combined using the Boolean operators OR and AND. The end search was conducted between the 24th and the 27th of July 2011 in the PubMed database (the free Medline version) and in the Cumulative Index of Nursing and Allied Health Literature database (CINAHL Plus with full text, using EBSCO Host).

Finally, two methods were used to analyse the Italian situation regarding the adoption of the HTA method in the field of nursing:
1. carrying out a ‘direct’ research in the archives of the main Italian scientific nursing journals, including the indexed ones and
2. broadening the research to include the body of ‘grey literature’ specific to the Italian context. This is made necessary by the fact that Italy lacks a database of dissertations.

The first part of the research was carried out from 30 September to 5 October 2011 searching the archives of the Italian national nursing journals and in the Index of the Italian Scientific Literature of Nursing (ILISI) database. The search terms included free words (HTA, Health Technology Assessment, Valutazione Tecnologie Sanitarie), key words (Healthcare Economy, Management and Leadership) in the ILISI index. The second part of the research, aimed at identifying material pertaining to the body of grey literature, was conducted, searching the ‘Google Scholar’ search engine with the words HTA, Health Technology Assessment and Infermieristica combined with the Boolean operators OR and AND.

Selection criterion of the study extraction
In the HTA database, over 50% of the records lack an abstract. Having increased the specificity of the research, (in order not to weaken the weight of the evidence which was found) this meant that the title and the key words listed in the ‘Subject’ field of the articles were also analysed (as well as the abstract when available).

In the PubMed and CINAHL databases, the inclusion criterion was studies on the HTA process in the nursing field, while the exclusion criteria for the articles were evaluation studies on nursing which did not adopt the HTA process and studies found within the HTA database.

The search in PubMed and CINAHL databases was set to include article abstracts or full texts published within the last 10 years. No limits were set on HTA and ILISI databases search.

Results
The search carried out in the HTA database, instrumental in the development of the first area of research on HTA in nursing, yielded 117 articles. This is caused by the search terms being planned to obtain a high level of sensitivity with the aim of maximizing the number of studies obtained from the database. The only undesirable limiting factor that emerged was connected with the availability of an abstract, which entailed reading the article summaries where the abstract was nonexistent. The search strategy adopted produced 78 studies on nursing conducted according to the HTA methodology including one nursing study on the HTA (see Table S1).

The research for nursing studies on the HTA in the PubMed and CINAHL databases produced 814 studies in the first database and 203 in the second database. Out of the 1017 articles obtained, a total of 74 studies were included. Nursing articles that failed to respect the HTA evaluation criteria were excluded (11 articles), as also those which were included in the HTA database (62 articles). This was carried out to obtain the sole inclusion of nursing articles addressing the application of the HTA methodology to the field of nursing (Willman et al. 2003).

The most difficult step, unexpectedly, was the second step, that is, the selection of the articles in accordance with the inclusion criteria of the second hypothesized area of research: nursing research on the use of the HTA process in the field of nursing.

Surprisingly, of the 1017 articles selected, after careful analysis, only 1 article specifically address the subject of the research question. To this must be added one study identified in the HTA database (Partanen & Peräläm 1998).

The ILISI (index of the Italian scientific literature of nursing) contains bibliographical tables, indexed by nurses, of the articles published in the main nursing journals and journals of nursing interest in Italy (Stievano et al. 2011). Through a rapid search with free words, key words in the ILISI index and then with a search by categories, eight articles were found. Of these articles, only the one by Leto (2007) pertinently address the research question.

The search, conducted with ‘Google Scholar’, aimed at identifying material pertaining to the body of grey literature, yielded two pertinent items: a dissertation of a Master in Nursing Science (Mulloni 2010a) and a paper presented at the XXIV ANIARTI National Congress (Associazione Nazionale di Infermieri di Area Critica), an Italian association of critical care nurses (Leto 2005).

Discussion
The HTA database where the first search was carried out is managed by the Centre for Reviews and Dissemination (CRD)
and by York University (UK) with the collaboration of the members of the International Network of Agencies for Health Technology Assessment (INAHTA) along with other agencies and institutional organizations for health technology evaluation. The scope of the database is to offer an overview, as complete as possible, of the studies conducted worldwide on the evaluation of health technologies. As well as systematic reviews, the HTA database encloses trial studies and research on health economics. Over 3000 records have abstracts, and to date, the HTA database contains a total of about 7000 studies.

The first point to be made is that the studies that were included in this research project represent approximately 1.12% of all the studies present in the HTA database. As proof of this first result, 990 publications on studies regarding HTA have been extracted from a recent list dated 10 June 2011. Eleven of the studies are correlated to nursing research, and in this case too, they represent 1.1% of all the studies.

From a first glance at the health evaluations analysed, nursing appears not to have been widely studied for the aspects that the HTA evaluates (i.e. safety, clinical efficacy, costs and economic, organizational, ethical, social and legal evaluations). This is in contrast with the study of other health aspects such as medicines, medical devices and biomedical equipment, although the evaluative process of the HTA also studies, by definition, intangible health technologies.

Another fact highlighted by the research is that the largest number of studies come from the UK (23 studies) and the USA (16 studies), followed by Canada (8 studies). New Zealand and Spain follow with five studies, the Netherlands, Denmark and Sweden with four studies each. Surprisingly, Malaysia is present with two studies as are also Germany and Norway. Finland, France and Austria are at the end of the list with one study each.

In the studies included in this first area of research, the most widely addressed field of nursing was community nursing (17 out of 78 studies), which thus catalysed the attention of 22% of the research projects.

The second most researched area is represented by wound care, in which there were 14 studies (18% of the total number of studies). With eight studies, each emergency/critical care nursing and oncological/palliative nursing accounts for a further 20% of the total (10% and 10%, respectively).

These are followed by studies on organizational and educational models (seven studies) and those on psychiatric and pediatric nursing (six studied per speciality).

The field of pediatrics was the subject of four research projects.

The remaining studies address some areas of specialized, hospital or rehabilitation nursing.

There are very few studies by nurses who use the HTA in the field of nursing, and yet when the phenomenon of Health Technology Evaluation was beginning and spreading worldwide, there was no shortage of nurses fascinated by novelty and ready to carefully evaluate the implications and opportunities of the Technology Assessment in the field of nursing (Pillar et al. 1990).

However, from the searches carried out in the two main nursing databases, PubMed and CINAHL, only one study matched the inclusion criteria for the literature search chosen for this research project. Another significant nursing study on the HTA approach was found in the HTA database search.

The first study, published by the Swedish Society of Nursing in 2003, was carried out by Willman et al. (2003). After a brief introduction on the HTA and on the well-established Swedish government agency of HTA, the Swedish Council on Technology Assessment in Health Care (SBU), the authors present their procedure:

• approaches in the care relationship,
• nursing methods for the provision of support and treatment,
• methods for assessing suffering/well-being in health, ill-health and disease,
• methods for preventing ill-health and/or treating ill-health,
• methods for treating and evaluating planned individual care, and
• methods for the organization of individual care.
For each area, the authors propose a series of methodological examples which they complete with an appendix of clinical studies based on qualitative and quantitative research.

For the first area, 14 approaches are proposed, based on theoretical constructs with a synopsis of the research outcomes based on 23 studies and the implementation possibilities.

The same schema is followed for the remaining five areas of the study.

As regards the support or treatment interventions, 33 intervention methodologies are proposed, supported by 55 studies, for the most part recent (last 10 years), with the exception of one study on the treatment of depression dating from 1967.

For the third area, 38 nursing scales, tools and evaluation methodologies are proposed with 33 references.

Lastly, for the remaining three areas, ten studies are presented as support for nine approaches to serve as guidance in clinical practice.

The second study, by Partanen & Peräläm (1998), offers the most extensive body of information on the subject under study. The study is an international and Finnish literature review on Technology Assessment in Nursing.

The search of secondary sources (meta-analysis, systematic reviews and other literature reviews) and primary studies was conducted in the following databases: CINAHL, MEDLINE, ArbSpriSwe, Sociofile, Cochrane Library CDSR, DARE and CCTR. For Finnish studies, however, articles were retrieved from the main national scientific, nursing journal, from nursing and healthcare theses (of BSc degrees, MA degrees and PhD degrees) and the Acts from national nursing congresses. The search was carried out by consulting the Nursing Annals (SHVK), the index of the Journal of Nursing Science and the indices of the Acts of congresses.

The authors identified 194 studies matching the search query of the review: 46 meta-analyses, 31 national primary studies and 117 international primary studies. The characteristics of each study were analysed in great detail. The healthcare interventions that were evaluated were grouped into seven:

- patient need assessment,
- promotion and maintenance,
- preventive methods,
- therapeutic methods,
- rehabilitative methods,
- working patterns and other process-related methods, and
- administrative support systems.

The meta-analysis studies found were carried out in the USA, Canada and the UK.

Adults are the most widely studied (26 of 27 studies, i.e. 58.7% of all the meta-analyses): this is in line with the trend in the primary studies analysed by the authors (68 studies of 117, i.e. 58.1% of all the international primary studies).

Most of the Finnish evaluation studies also address prevention interventions in adults.

There was a dearth of evaluative research with children, patient’s relatives and outpatient care.

In summary, the authors conclude that although in Finland the research on nursing methods is limited, the number of international primary and secondary evaluative nursing studies bodes well for future research.

The Finnish authors point out the following as the most frequently encountered research flaws in the studies analysed:

- methodological shortcomings (e.g. a lack of randomization or controls),
- numerically low participant samples, and
- absence of economic evaluation.

The last point, of great pertinence to this research project, is in line with the opinion of Lamas et al. (2009).

According to this nursing literature review on the economic evaluation of nursing, carried out by Swedish colleagues who analysed 115 studied (published between 1984 and 2007), subdivided into four intervention areas [i.e. treatment and support (17 studies), evaluation of health/illness conditions (1 study), primary and secondary prevention (53 studies), personalizes healthcare planning (44 studies)], only

- in 22% of the studies analysed, the authors state the economic evaluation method adopted,
- in 25% of the studies, the authors state their viewpoint regarding economic assessment and adopt sufficient economic indicators, and
- In 82 out of 115 studies (71% of the total), they perform a cost–effective analysis of nursing interventions. These findings pose further questions and this shows how much work is still needed in the field of economic assessment as applied to nursing.

Finally, the recommendations for clinical practice, for education, and for research and development presented in the Finnish report were very interesting.

A search in the archives of the main Italian nursing journals and in the ILISI (digital index of the Italian scientific nursing literature) reveals an absence of published research on methodologies and evaluation of HTA as applied to nursing. The only article that emerged is by Leto (2007), published in January/March, Issue 1 of the NEU with the pertinent title ‘L’Health Technology Assessment (HTA) applicata all’infermiere’ (i.e. The Health Technology Assessment applied to nursing).

The author describes the origins of the HTA approach, its European and worldwide development and the Italian situation,
and discusses the philosophy and rationale behind HTA. Only in her conclusion does Leto proposed more involvement of the nursing profession in the evaluation processes both at the macro- and the micro-organizational levels of the nursing profession, a ‘nursing profession which has, to date, played only a marginal role in the purchasing processes of medical facilities and technologies’ (Leto 2007, p. 30).

However, in the first grey literature article found (a paper given at the XXIV ANIARTI National Congress, 2005), it was Leto who, in presenting an organizational model of the nursing management in the Lazio region, put forward three possible levels of professional involvement in the purchasing of technologies:

1. management level,
2. implementation of purchases level, and
3. usability level.

At the first level, the director of the nursing services, in his capacity as a member of the Board of Directors, expresses a binding opinion on purchases.

The presence of a Nursing Director or a Nursing Coordinator at the drafting of the tender specifications, fulfils the need (at the level of implementation of purchases) to obtain a technical opinion on the drafting of the tender specifications and for an assessment of usability which can be made after on-field testing of the product/technology. On-field testing also aims to evaluate the fit between the characteristics stated by the vendor and the practical performance of the products.

As regards the third level (usability level), once the tenders have come in, the nursing staff, performing quality checks, should report deviations from the product specifications (Leto 2005).

Leto’s proposed operational procedure involves the creation of a pool of expert nurses (with a specific educational profile, i.e. pertinent MA degree in management) to be allocated to specific teams:

1. at the regional level, as centralized observers, and
2. at the local level, in the local health authorities (Italian ASL, Azienda Sanitaria Locale and Hospital Companies) in decision-making settings.

The second study found is a thesis for a Master’s degree in Nursing and Midwifery by Giovanna Mulloni in the academic year 2009/2010 at the University of Udine, Italy. The study has two objectives:

1. to verify the applicability of HTA methodology to the evaluation of departmental organizational models conceived as ‘health technology’ and
2. to verify the effect of the departmental organizational model on the clinical outcomes, to be validated by means of a ‘blind’ collection of the experts’ opinions.

The analyses and the study refer to two surgical departments, one belonging to the University Hospital of Udine, Italy, and the other one belonging to the Provincial Health Authorities of Trento, Italy.

The analysis firstly addressed the structural and procedural aspects of the two departments and, secondly, the outcomes of patients suffering from colon cancer after surgery.

The study was a multi-method comprising a descriptive-correlational part and the second phase of research was qualitative (i.e. a panel of 15 experts).

The organizational, economical, ethical and social dimensions (independent variables) were correlated with the healthcare dimension (dependent variable) through outcome indicators observed in patients discharged with diagnoses of ‘malignant neoplasm of the colon’ who had undergone surgery, through the observation of 51 variables with a score ranging from 1 to 4, a scale to quantify the various dimensions studied.

Having evaluated all the HTA dimensions, the conclusion reached by the study is that the application of the HTA methodology is appropriate for the analysis of organizational models. The adoption of a tailored tool for the evaluation of the five dimensions has allowed for the detection of differences, which are useful to clinical governance decision-makers, and this, as pointed out by Mulloni, is in harmony with the action-orientated nature of the HTA.

The study also shows how ‘organization technology’ (departmental in this case) ‘influences the patient outcomes, highlighting the most effective practices (e.g. facilities for care continuity; action planning for hospitalization and/or surgery, in an integrated manner with regard to available human, logistical and technological resources’) (Mulloni 2010a, p. 6).

The results of this study were presented by the author during the Third National Congress of the Italian Society of Health Technology Assessment, held in Torino, 4–5 November 2010, which focused on experiences of applied HTA in daily practice (Mulloni 2010b).

**Conclusions**

The research question underlying the present project aims at understanding the extent to which the HTA process is applied in daily nursing practice at an international level, along with the possibilities for the inclusion of the Nursing Director in the assessment of health technologies in Italy.

To answer the question, three areas of research were established: the first area aims to understand how much attention the HTA world pays to nursing ‘health technology’; the second area aims to locate nursing research on the HTA approach which might point the way towards the development of an area, that of the evaluation of health technologies, an increasingly important
factor for strategy planning at different organizational levels of the Italian national healthcare service. The third area of research aims to describe the state of the art of HTA as applied to the field of nursing in Italy.

The present project shows how there is, to date, very little international, depth nursing research on the subject of HTA.

We can hypothesize two main reasons for these findings:
1. Nursing is still undergoing an exciting and on-going terminology standardization process, despite the important work which began in 1973 by a group from the USA, which was later become the North American Nursing Diagnosis Association (NANDA-International), or by the research team of the University of Iowa (McCloskey & Bulechek 1994), and by the International Council of Nurses itself. The consolidation of such a standardized terminology for the description of nursing diagnoses, interventions and outcomes cannot fail to facilitate, apart from the imaginable positive clinical practice and development effects, an increased and better chance of evaluation of nursing action in its many expressions (Clark & Lang 1997; Crawford et al. 1996; Ebener et al. 1996; Lush & Jones 1995; Maas et al. 1996).

2. There is a lively debate on the most appropriate research instruments for the study of the ‘nursing phenomenon’. Some researchers see qualitative research as the most appropriate, others prefer to develop quantitative research.

HTA relies on both types of research but allocates a higher status to the more solid scientific evidence of efficacy in accordance with evidence-based medicine and evidence-based nursing, that is, meta-analysis and randomized controlled trial (RCT).

In the field of nursing, there is no shortage of high quality, RCTs and meta-analyses (studies that comply strictly with the most common standard of research such as the CONSORT for the randomized and quasi-randomized controlled trial, the STROBE for the observational cohort, case–control and cross-sectional studies, the STARD for the study of diagnostic accuracy/assessment scale, the MOOSE for systematic review of observational studies, etc.), but the debate on how to ‘read’ and describe nursing phenomena is still open (Spilsbury & Meyer 2001).

Implications for practice
Apart from the phenomenological perspective and the development of a standardized language, it is impossible to disagree with those who would like to see nurses and especially nursing managers developing the capacity to take part in the decisions made in the complex field of healthcare (Clancy & Delaney 2005; Smith 2004) and taking part in HTA projects (Mullally 2004).

The development of specific skills in the field of healthcare assessment could be the subject of a PhD (Columbia University School of Nursing 2006) or a Master’s degree.

HTA, which is, by definition, multidisciplinary, will benefit from the contribution of nurses who have undergone a specific education for the assessment of health technologies at the different levels at which HTA takes place, at the same time the HTA approach can be a great opportunity for the nursing world.

Acknowledgements
I would like to thank Federico Spandonaro, researcher at the Faculty of Economics, University of Rome ‘Tor Vergata’, Italy.

Source of funding statement
This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Conflict of interest statement
No conflict of interest has been declared by the author.

References


Supporting information
Additional Supporting Information may be found in the online version of this article:

Table S1 Health Technology Assessment (HTA) studies on nursing in HTA database