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Does Convenience Matter in Health Care Delivery? A Systematic Review of Convenience-Based Aspects of Process Utility

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ABSTRACT

Objectives: To systematically review the existing literature on the value associated with convenience in health care delivery, independent of health outcomes, and to try to estimate the likely magnitude of any value found. **Methods:** A systematic search was conducted for previously published studies that reported preferences for convenience-related aspects of health care delivery in a manner that was consistent with either cost-utility analysis or cost-benefit analysis. Data were analyzed in terms of the methodologies used, the aspects of convenience considered, and the values reported. **Results:** Literature searches generated 4715 records. Following a review of abstracts or full-text articles, 27 were selected for inclusion. Twenty-six studies reported some evidence of convenience-related process utility, in the form of either a positive utility or a positive willingness to pay. The aspects of convenience valued most often were mode of administration (n = 11) and location of treatment (n = 6). The most common valuation methodology was a discrete-choice experiment containing a cost component (n = 15). **Conclusions:** A preference for convenience-related process utility exists, independent of health outcomes. Given the diverse methodologies used to calculate it, and the range of aspects being valued, however, it is difficult to assess how large such a preference might be, or how it may be effectively incorporated into an economic evaluation. Increased consistency in reporting these preferences is required to assess these issues more accurately.

Keywords: health care, preference elicitation, process utility, systematic review.

Introduction

Quality-adjusted life-years (QALYs) reflect the health benefits gained from an intervention in terms of additional years of life and health-related quality of life [1,2]. Recent years have seen an increased level of interest in the definition and valuation of health care outcomes beyond those traditionally encapsulated by QALYs. The QALY framework, commonly used in the economic evaluation of health interventions, including by the National Institute for Health and Care Excellence (NICE) in the United Kingdom, focuses on health benefits gained from an intervention and does not take account of other potential effects of health care. Recently, NICE in the United Kingdom has recognized the importance of other health care outcomes in its updated version of the *Guide to the Methods of Technology Appraisal*. Although NICE still focuses on health effects for its reference case analysis, it now allows consideration of evidence on the "process characteristics" of health care technologies that have a value to people independently of any direct effect on health, such as improving convenience in delivery and administration of care, and the level of information provided to patients [3]. Others have also recently proposed considering a broader range of definitions of outcomes of health care, including the role of happiness in health valuation [4] and measuring both health and nonhealth benefits when evaluating more complex health interventions [5].

The assumption that health gain is the only relevant outcome of an intervention may lead to a neglect of other factors that potentially ought to be valued. This has been well articulated in the past by Mooney [6], who points out that within the patient's utility function, other characteristics of "health care," beyond the relatively narrow definition of "health," are unacknowledged. These other characteristics are encompassed within the term "process utility," an umbrella term for the utility gained from the nonhealth aspects of health care that patients experience, independent of the ultimate health-related outcome. Not incorporating process utility into the overall valuation of utility from health care could therefore potentially lead to a suboptimal provision of health care [7] because health care allocation will not have taken all relevant characteristics into account.

The importance of nonhealth outcomes of health care is recognized in existing health policies, which may have wider goals, beyond the sole objective of improving health outcomes. In the United Kingdom, policies have been introduced that address nonhealth outcomes such as the reduction in mixed-sex wards to maintain the privacy and dignity of patients [8]. Other changes in

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health care provision, such as the centralization or localization of health care services, also have potential to have an impact on process utility. A NICE-commissioned report into the value of innovation and other benefits in the United Kingdom [9], distinct from improved health outcomes, suggested that benefits that could potentially make a "real difference" to patients are not all being valued and that other aspects of care that matter to patients are being overlooked.

Of course, the optimal resource allocation in any individual health system depends on the objectives of that system. If the objective is purely to maximize health, then it could be argued that any value derived from a process is irrelevant. If, however, the objective is to maximize well-being or to align resources to the preferences of the population served by the system, then a consideration of process-related outcomes is potentially important because without this, the values assigned to health care technologies could fail to reflect the true value of care to patients. Aiming to measure process utility as part of a wider attempt to maximize well-being is also in accordance with the definition of health given by the World Health Organization, describing health as a state of "complete physical, mental and social well-being, and not merely the absence of disease or infirmity" [10].

Process utility encapsulates values arising from a wide range of health care characteristics, from the practical—such as the frequency of administration of a given treatment—to the more conceptual and abstract, for example, dignity. As with other forms of utility, process utility reflects a continuum on which the magnitude of values is likely to vary between aspects of health care, the circumstances in which they are delivered, and individuals' preferences. One recent review [11] reported studies looking at measurements of process utility in general. In comparison, this review focuses specifically on process utility associated solely with the convenience of health care provision. It also reports preference measurements, such as willingness to pay (WTP), which could be incorporated into cost analyses and economic evaluations that fall outside the traditional QALY [11].

Preferences related to convenience are relevant to a range of health interventions. For example, preferences toward waiting time or distance from care will clearly be relevant to higher-level decisions around the regionalization or centralization of health services. Convenience-related process utility may also be an issue in the assessment of pharmaceuticals and other health technologies. Increasingly, new developments in health care technologies are not related solely to health gains but to developments relating to the frequency or mode of administration. These innovations may have value to patients beyond any effect on patient health (e.g., an improvement in health outcomes deriving from improved concordance with treatment regimens) if they make disease management easier and more convenient. To date, little research has been conducted around the magnitude of such effects. If the worth of these process characteristics is shown to be of sufficient magnitude, their valuation relative to health effects would allow their inclusion in health technology assessments (HTAs).

It was therefore timely and appropriate to examine the evidence to date surrounding the existence of convenience-related process utility and to establish whether patients care only about the health benefits they receive or whether they also care about the manner in which these benefits are delivered. The aim of this study was to establish whether people value convenience in health care and estimate the likely magnitude of those values by systematically reviewing the published evidence.

Methods

Literature searches were performed in two databases—Ovid MEDLINE and Scopus—in June 2013. Search strategies are outlined in Appendix A in Supplemental Materials found at http://dx.doi.org/%2010.1016/j.jval.2014.08.2670. No date or language limitations were applied. Only full articles were included for consideration; conference materials and abstracts were excluded because these were not expected to provide details of methods and results in sufficient detail. To be considered for inclusion, articles needed to assess preferences for a convenience-related aspect of a treatment or intervention, including (but not restricted to) the following: distance to travel, duration of intervention, frequency of intervention, location/setting, mode of administration, or waiting time. Articles were restricted to those reporting preferences on a scale compatible with inclusion in the cost-utility analysis framework (standard gamble [SG] or time trade-off [TTO]) or cost-benefit analysis (contingent valuation including WTP). Data from discrete-choice experiments (DCEs) were included if the experiment contained a cost attribute (e.g., cost per month) from which a WTP estimate could be derived. DCEs without a financial attribute were not included.

Two researchers (A.H. and J.S.) screened all titles and abstracts for eligibility. Discrepancies were resolved via consultation with a third researcher (L.L.), who made the final decision when consensus could not be reached. Full-text versions of all potentially relevant articles were obtained, and reviewed by A.H. using the same inclusion criteria. Articles that met preset inclusion criteria were included in the review.

A data extraction template was developed and implemented as a Microsoft Excel workbook and used to extract relevant data from the included articles. A range of data was extracted. Points of key interest included aspect of convenience valued, valuation methodology used, value of the utility, and any overall conclusions that could be drawn from the article with respect to process utility.

The data identification process is represented graphically using a Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow chart in Figure 1 [12].

All financial values were converted to Great Britain pounds using a currency conversion Web site (www.xe.com) and updated to 2012 values (the most recent available) to allow for ease of comparison.

Results

Search Results

Initial searches identified 4355 results in MEDLINE and 360 in Scopus. Following the screening of unsuitable titles and abstracts and removal of duplicates, 39 abstracts were determined to meet the specified inclusion criteria (30 from MEDLINE and 9 from Scopus). These articles were obtained and reviewed in full according to the original inclusion criteria. Twenty-seven articles were identified as meeting the inclusion criteria and were brought forward for data extraction.

Key Characteristics of Studies

Studies identified and reviewed were published between 1996 and 2013, and came from Canada (n = 7) [13–19], the United States (n = 3) [20–22], the United Kingdom (n = 3) [23–25], Scotland (n = 3) [26–28], Australia (n = 3) [29–31], Sweden (n = 2) [32,33], Denmark (n = 1) [34], Germany (n = 1) [35], Italy (n = 1) [36], and Spain (n = 1) [37]. Two studies had multinational perspectives [38,39]. Study characteristics are expanded upon in Table 1.

Aspects of convenience valued can be classified broadly into two categories: Those relating to the administration of an intervention, for example, dosing frequency or mode of administration [13,15,18,19,21,23,24,26,30–34,36–39], and those looking at ease of access to an intervention, for example, distance to travel [14,16,17,20,25,28,29,35]. Two studies spanned both categories [22,27].

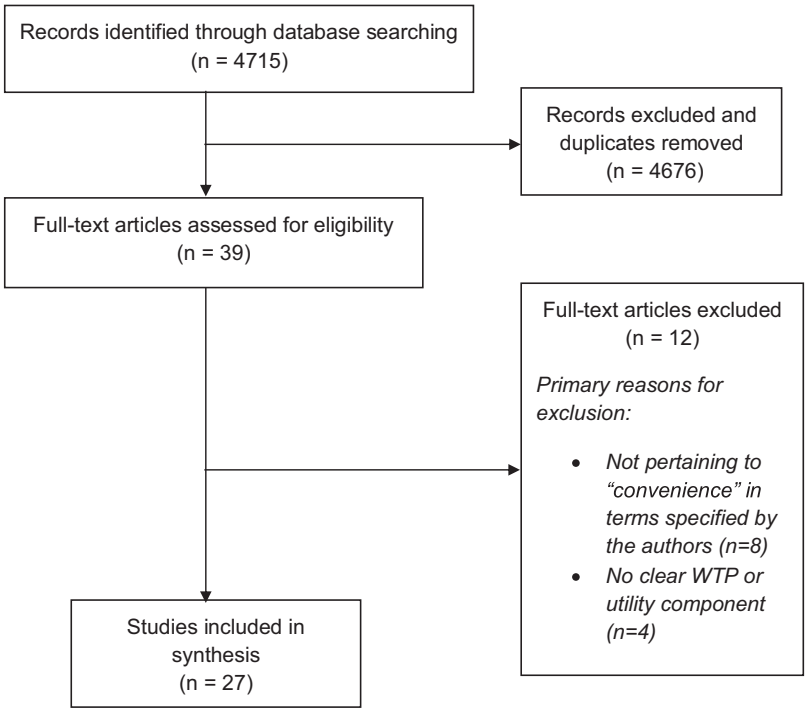

Fig. 1 – Flow diagram of systematic review to identify included studies.

The nomenclature used to describe similar attributes varied from study to study, even when the concepts being described were fundamentally the same. For example, three studies [14,20,29] assessed preferences for home treatment versus treatment in a clinical setting. In these studies, the descriptions of the attribute being valued (home treatment) were quite uniform, and assumed identical levels of safety and efficacy in all treatment settings, thus assessing solely the convenience of receiving care in the home environment. (This was modified slightly in Coley et al. [20], in which the pragmatic assumption was made that increasing levels of disease severity would automatically require higher levels of hospital care.)

Preference-elicitation methods included SG (n = 2) [20,26], WTP (n = 8) [14,18–21,29,33,35], and TTO (n = 3) [23,30,31] (Table 2). A substantial proportion of the studies (56%) took the form of a DCE, using a financial or cost-related attribute to derive a WTP valuation for convenience [13,15–17,22,24,25,27,28,32,34,36–39].

Considering first the studies using the SG approach, Boye et al. [26] used traditional upper anchors of "perfect health," assigned a utility value of 1, and "worst health state," assigned a value of 0, subsequently adjusted so that the lower anchor, with a value of 0, was representative of death. This was done using the chained method developed by Torrance. Chaining is used when the disability health states to be measured are mild, making it appear unrealistic to compare them directly with death. Instead, states are measured relative to an anchor state worse than the state of interest. A second measurement then measures this state relative to death. The situation arises most often with the SG but can also apply to the TTO [40,41]. The SG component of Coley et al.'s methodology was similar, using upper and lower anchors of "usual health" and "death," respectively [20].

Three studies used TTO techniques to elicit preferences [23,30,31]. TTO techniques value health states by quantifying how much, if any, life expectancy people are willing to forego (or "trade off") to avoid that state [42]. One study [23] obtained utility values from patients for hypothetical treatment scenarios using two methods: a chained TTO design and by reporting expected responses to the EQ-5D questionnaire. For all scenarios, respondents attached higher utilities to the more "convenient" intervention—in this case, inhaled versus injected insulin—when the TTO design was used. Marginal utility ranged from 0.1 to 0.14 using TTO methodologies and from 0.03 to 0.06 using EQ-5D questionnaire data [23]. These differing values for identical clinical scenarios are suggestive of a greater sensitivity in TTO methodologies for process-related factors, indicating that they may be an appropriate design for future preference elicitation studies. The other two TTO studies [30,31] examined the utility associated with the mode and duration of administration. Both reported a mean marginal increase in utilities associated with the more convenient intervention (Table 2)—Johnson et al. [30] reported an increase from 0.475 to 0.837. Patients were not asked to explain their preferences in the study, and it is therefore not possible to establish the reasons behind this substantial increase; however, it is possible that some respondents considered potential health impacts, in addition to convenience, resulting from intravenous administration (e.g., risk of infection). Nevertheless, together these estimates suggest that not accounting for process utility may have an impact on accurate assessment of patient preferences.

Substantial variation was observed between studies in the use of different WTP methodologies. The WTP component of Coley et al.'s [20] study used a standard bidding approach to ascertain respondents' WTP to remain in usual health, and to avoid more severe health states. Marra et al. [14] used open-ended WTP, while the DCE studies required respondents to select a value from a set of prespecified levels [13,15,17,28,29,33–36,38]. Both these designs have the potential to lead to bias.

Looking at evidence of preferences, of the 27 studies reviewed, all but one found evidence of preferences for convenience-related utility (Table 3). Although preference values varied substantially between studies—and within studies, in the case of multinational studies—the existence of the preference itself seemed clear. The

Table 1 – Study characteristics.

S. no.	Study	Year	Country	Intervention	Patient description	Age (mean) (y)	Sex (% male)
1	Aristides et al. [38]	2004	France, Germany, Spain, Italy, United Kingdom	Insulin treatment for type 2 diabetes	European diabetic patients aged 18–70 y receiving regular insulin mix injections	51	46
2	Aust et al. [35]	2011	Germany	Preferences for anesthetic treatment	Patients aged 14–86 y undergoing anesthetic treatment	NR*	NR
3	Bogelund et al. [34]	2011	Denmark	Insulin treatment for type 2 diabetes	Danish diabetic patients	NR	66
4	Boye et al. [26]	2011	Scotland	Injectable insulin treatment for type 2 diabetes	Patients with type 2 diabetes, age 30–75 y	59	66
5	Chancellor et al. [23]	2008	United Kingdom	Inhaled/injectable insulin treatment for type 1/type 2 diabetes	UK diabetic adults 18 y or older	58	66
6	Coley et al. [20]	1996	United States	Low-risk community-acquired pneumonia (CAP)	Patients older than 18 y enrolled in treatment for CAP (hospitalized or outpatient)	44	37
7	Darba et al. [37]	2011	Spain	Prevention of osteoporosis fractures	Patients with osteoporosis	69	5
8	Guimaraes et al. [13]	2009	Canada	Inhaled/injectable insulin treatment for type 1/type 2 diabetes	Diabetic patients 19 y or older using oral antihypoglycemic agents or insulin	57	52
9	Hodgkins et al. [39]	2012	United States, United Kingdom, Germany, Canada	5-Aminosalicylic acid for ulcerative colitis (UC)	Patients 18 y or older diagnosed with mild to moderate UC (self-reported)	NR	NR
10	Jampel et al. [21]	2005	United States	Eyedrops for glaucoma	Adult patients receiving follow-up for glaucoma or suspicion of glaucoma	66	46
11	Jendle et al. [32]	2012	Sweden	Liraglutide for type 2 diabetes	Swedish patients with type 2 diabetes	NR	NR
12	Johnson et al. [30]	1996	Australia	Maintenance antiviral treatment for cytomegalovirus (CMV) retinitis infection	Patients with confirmed HIV infection but without CMV retinitis	NR	>99
13	Landfeldt et al. [33]	2012	Sweden	Ovarian stimulation treatments	Women undergoing IVF treatment	35	0
14	Marra et al. [14]	2005	Canada	Outpatient parenteral antibiotic therapy (OPAT)	Adult patients eligible for OPAT requiring antibiotics for expected minimum of 5 d and living in suitable home environment	56	69
15	McTaggart-Cowan et al. [15]	2008	Canada	Asthma therapy	Patients aged 19–49 y with physician-diagnosed asthma and no concurrent respiratory conditions	35	30
16	Moia et al. [36]	2013	Italy	Anticoagulant therapy	Patients on stable vitamin K anticoagulants for >6 mo or about to start a therapy course	64	55
17	Osborne et al. [31]	2007	Australia	Deferoxamine treatment for chronic iron overload	Convenience sample of the general public	NR	50
18	Ossa et al. [24]	2007	United Kingdom	Erythropoietin treatment in chemotherapy-related anemia	Convenience sample of the general public aged >18 y	45	42
19	Oteng et al. [16]	2011	Canada	HPV and cervical cancer screening	Representative sample of Canadians aged >19 y	44	51

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20	Phillips et al. [22]	2002	United States	HIV testing	Patients about to undergo HIV testing	34	77
21	Porteous et al. [25]	2006	United Kingdom	Preference for types of care	Convenience sample	NR	50
22	Roux et al. [17]	2004	Canada	Weight loss programs	Members of the community aged 25 y or older with BMI ≥25 enrolled in community weight loss programs	NR	17
23	Wordsworth et al. [28]	2006	Scotland	Cervical cancer screening	Population sample of women who had and had not had a smear test	38	0
24	Watson et al. [27]	2009	Scotland	Chlamydia screening	Women attending a family planning clinic in Aberdeen	NR	0
25	Sadri [18]	2007	Canada	Inhaled insulin for diabetes	Ontario residents older than 18 y	55	53
26	Sadri et al. [19]	2005	Canada	Inhaled insulin for diabetes	Patients older than 18 y using one or more antihyperglycemic agents and/or insulin	52	61
27	Whitty et al. [29]	2013	Australia	Chronic heart failure management	Subset of patients already in a trial of heart failure interventions	71	66

BMI, body mass index; HPF, human papillomavirus; IVF, in vitro fertilization; NR, not reported.

highest valuation assigned by a WTP study was a one-off payment of £239.25 (95% confidence interval £223.30–255.20) for the use of a prefilled pen versus a conventional syringe in the administration of insulin for diabetes treatment [33].

The study that found a disutility associated with convenience-related attributes [28] examined preferences surrounding the frequency of cervical cancer screening. Respondents expressed a WTP for more frequent screening (a marginal WTP of £16.54 per 1-year decrease in screening intervals). It is likely that this is due to the preventive nature of the intervention in question—that the perceived future avoidance of health problems (and associated inconveniences) would outweigh any inconvenience incurred by the preventive screening itself. Oteng et al. [16], however, also examined preferences surrounding human papillomavirus and cervical cancer screening: Their results, in contrast to those of Wordsworth et al. [28], found evidence of preferences for reduced frequency of screening (a negative WTP of £4.54 for an annual smear test compared with a positive valuation of £17.52 for a reduction in frequency to once every 3 years). Neither study held health constant, that is, explicitly stated that changes in other attributes would not have an impact on health outcomes. This means that there may be other, unobservable interactions happening between health states and other attributes within either or both the studies that have not been identified or accounted for in the results. The contradiction between the two studies is indicative of some of the complexities surrounding the issue of process utility, and the challenges involved in untangling preferences.

Discussion

This review has identified studies reporting utility and monetary estimates for convenience-related utility. The results point to a modest, but positive, value placed by patients and the public on convenience-related aspects of health care. The values provided in the studies were varied and reflect the large degree of methodological variability exhibited in the studies, as well as the range of different aspects of convenience considered.

The implications of failing to take account of process utility are manifold. If process utility is not appropriately incorporated into economic evaluations, there is a risk of suboptimal resource allocation. Factors such as social value judgments merit consideration, and perspectives may need to be adjusted to reflect the true utility of an intervention, particularly when the external, process-related benefits are likely to be substantially greater than any displaced health-related ones [43]. If process factors are not taken into consideration when health care resources are being allocated, there will be a misalignment between the stated aims of health care policy and the realities of resource use.

Whether this is actually the case, and to what extent, depends on the magnitude of the utility derived from not only the process but also health gain and the cost of the intervention. The focus should not be on promoting process utility above all other decision-making factors but on developing a balanced view of the overall costs and utilities associated with an intervention. The valuation of process outcomes relative to health gain can provide useful information to health care decision makers. Valuation in this way is arguably more consistent with HTA frameworks that focus on incremental cost-per-QALY or life-year analyses. It also explicitly reflects the potential trade-off in the decision problem faced by health care providers: When faced with a resource constraint, is the opportunity cost (in terms of health lost) worth the gain derived from improvements in process of care [3]? Finally, valuing process relative to health gain may facilitate comparison with existing explicit and implicit

Table 2 – Methods of elicitation.

S. no.	Author	n	Convenience-related attribute(s)	Method of elicitation
1	Aristides et al. [38]	235	Timing of injection relative to meals	WTP values obtained via questionnaire. Values derived using preferences for two other attributes relative to cost within DCE.
2	Aust et al. [35]	1014	Location of visit	WTP values obtained via questionnaire. Values derived using the proportions of a fixed sum of money respondents were willing to allocate to a particular attribute.
3	Bogelund et al. [34]	270	1) Mode of administration 2) Method of blood glucose monitoring	WTP values obtained via questionnaire. Values derived using preferences for four other attributes relative to additional payments within DCE.
4	Boye et al. [26]	151	1) Dose frequency 2) Dose flexibility	SG values obtained in interviews. Health states described in terms of injection site reaction, frequency, and fixed/flexible dose, and valued on a scale of worst health to perfect health (1), then rescaled by valuing worst health state relative to death (0).
5	Chancellor et al. [23]	344	Mode of administration	Chained TTO values obtained in interviews. First trade-off between treatment components of a scenario pair (e.g., inhaled or injectable insulin), then second trade-off between less preferred scenario and full health.
6	Coley et al. [20]	159	Treatment location—home or hospital setting	1) SG values obtained in interviews. Values anchored as usual health (1) and death (0). 2) WTP values obtained for preferred location/scenario, presented as maximum proportion of monthly income using a bidding approach.
7	Darba et al. [37]	166	1) Levels of administration 2) Place of administration	WTP values obtained via questionnaire. Values derived using preferences for two other attributes relative to cost within DCE.
8	Guimaraes et al. [13]	274	Mode of administration	WTP values obtained via questionnaire. Values derived using preferences for five other attributes relative to monthly out-of-pocket payment with DCE.
9	Hodgkins et al. [39]	400	1) Ease of swallowing 2) Time of day 3) Quantity	WTP values obtained via questionnaire. Values derived using preferences for five other attributes relative to monthly cost within DCE.
10	Jampel et al. [21]	230	Characteristics of eyedrops: Dosing frequency and number of bottles	WTP values obtained in interviews. Framed as out-of-pocket expense with/without co-payment.
11	Jendle et al. [32]	461	Mode of administration	WTP values obtained via questionnaire. Values derived using preferences for other attributes relative to out-of-pocket payment within DCE.
12	Johnson et al. [30]	80	1) Duration of treatment 2) Mode of administration	TTO values obtained via interview.
13	Landfeldt et al. [33]	294	1) Mode of administration 2) Frequency of administration 3) Dose variability	WTP values obtained via questionnaire. Contingent valuation question asked participants whether they would make an out-of-pocket payment of x to receive one set of treatment attributes instead of another.
14	Marra et al. [14]	91	Treatment location—home or hospital setting	WTP values obtained via questionnaire using an open-ended WTP approach.
15	McTaggart-Cowan et al. [15]	157	1) Dose per day 2) Number of inhalers	WTP values obtained via questionnaire. Values derived using preferences for six other attributes relative to cost per month within DCE.
16	Moia et al. [36]	255	1) Mode and frequency of administration 2) Monitoring frequency 3) Interactions with drugs or food 4) Need of dose adjustment 5) Risk of minor symptoms	WTP values obtained via questionnaire. Values derived using preferences for five other attributes relative to cost per month within DCE.
17	Osborne et al. [31]	110	Mode of administration	TTO values obtained via interview.
18	Ossa et al. [24]	110	Duration, mode, and location of administration	WTP values obtained via interview. Values derived using preferences for five other attributes relative to cost within DCE.

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Table 2 – *continued*

S. no.	Author	n	Convenience-related attribute(s)	Method of elicitation
19	Oteng et al. [16]	1157	Frequency of screening	WTP values obtained via questionnaire. Values derived using preferences for six other attributes relative to cost within DCE.
20	Phillips et al. [22]	354	1) Location 2) Ease of results collection	WTP values obtained via questionnaire. Values derived using preferences for other attributes relative to out-of-pocket payment within DCE.
21	Porteous et al. [25]	326	"Availability"—waiting time, travel time, and duration of treatment	WTP values obtained via questionnaire. Values derived using preferences for two other attributes relative to cost within DCE.
22	Roux et al. [17]	165	Travel time	WTP values obtained via questionnaire. Values derived using preferences for four other attributes relative to cost within DCE.
23	Wordsworth et al. [28]	577	Frequency of screening	WTP values obtained via questionnaire. Values derived using preferences for four other attributes relative to cost within DCE.
24	Watson et al. [27]	149	1) Location 2) Mode of screening	WTP values obtained from interviews. Values derived from preferences for four other attributes relative to one-off cost within DCE.
25	Sadri [18]	120	Mode of administration	WTP values obtained via interview using a close-ended WTP approach.
26	Sadri et al. [19]	96	Mode of administration	WTP values obtained via interview using a close-ended WTP approach.
27	Whitty et al. [29]	91	Treatment location—home or hospital setting	DCE values for clinic-based vs. home-based programs obtained via interview. WTP values for preferred program and estimated travel costs also obtained via interview using dichotomous bidding approach.

DCE, discrete-choice experiment; SG, standard gamble; TTO, time trade-off; WTP, willingness to pay.

cost-effectiveness thresholds that are usually expressed in terms of QALYs (or life-years gained) [44].

This recognition of the importance of value not directly related to health has recently been incorporated into NICE guidelines [3]. Although the guidelines do not currently recommend inclusion of process utility values into reference-case analyses—possibly due to differences in standard methodologies for eliciting preferences toward health and process outcomes, among other reasons—consideration of supporting evidence on these process characteristics is encouraged. NICE guidelines are an important indicator of the increasing relevance process utility has for decision makers, as well as the increasing urgency to develop appropriate quantitative methods to address it. The evidence reviewed here shows that preferences for convenience-related process utility are shown to exist across a wide spread of disease areas, and for various different aspects of health care, provided that elicitation methods give respondents the opportunity to express these preferences. Perhaps the challenge is to focus on the incorporation of these methodologies alongside typical health outcome metrics currently in use. This would help to add to the relatively small body of evidence currently in existence. Importantly, it may also lead to a shift in the way people think about nonhealth outcomes, by normalizing their valuation; they may in time come to be seen as an integral aspect of economic evaluation.

Sometimes, there will inevitably be an overlap between convenience and health outcomes. The best example of this is the relationship between administration and adherence. Making a treatment easier to administer or reducing the frequency of administration is likely to have a positive impact on adherence and concordance rates across a range of disease areas [45–47]. Improved adherence will result in improved health outcomes, which will be accounted for within the traditional QALY calculation. The evidence found in this review, however, suggest that process utility is valued, to some extent, for itself and not just for any indirect health gains that it may bring about. The challenge lies in identifying the point at which process and health gain utility no longer overlap, and quantifying the "pure" process utility.

This review was not without limitations. The search strategy was restricted to articles published in peer-reviewed journals, meaning that informally published or less accessible "gray" literature of potential relevance may have been overlooked. It is possible that some other useful indications of preferences for process utility may not have been incorporated, particularly from more qualitative studies. Although these sources may have indicated whether the process of care is of importance to people, the aim of the review was to identify measures that could be incorporated into an economic evaluation, and therefore the focus was on compatible quantitative analyses. The ambiguity surrounding concepts of process utility may also have led to useful literature not being identified, specifically the lack of standardized terminology describing process utility and the broad range of health care characteristics that may affect it. Furthermore, as for many reviews of this type, we cannot rule out the possibility of publication bias whereby studies finding "negative" or "null" results may not have been published.

In addition, the studies included in the review are themselves subject to individual limitations. Some studies included in the review had relatively small sample sizes: 10 of the 27 studies reported a sample size of fewer than 200 [15,17–19,21,24,27,29–31], with 1 study [30] having just 80 respondents. This has clear implications in terms of the generalizability of the results. The generalizability of the studies to other settings is also likely to be limited. For example, some studies identified are from jurisdictions with national health services funded by central taxation, whereas others are from insurance or co-payment systems, which could affect the results obtained. Aristides et al. [38] looked at WTP for attributes of insulin treatment in five European countries, all with some type of national health care system. WTP valuations not only varied very

Table 3 – Evidence of convenience-related process utility.

S. no.	Author	Evidence	Form of evidence	
			£	Utility values
1	Aristides et al. [38]	Yes	Mean WTP per month: £36.17 for an increase in dose frequency; £47.68 for a decrease in frequency of nocturnal hypoglycemic episodes	
2	Aust et al. [35]	Yes	WTP: £14.41 for home setting instead of clinical one	
3	Bogelund et al. [34]	Yes	Monthly WTP: One fewer injection per day (£34.23); able to inject irrespective of mealtimes (£26.13); oral administration instead of injection (with respect to meals) (£46.85); oral administration instead of injection irrespective of mealtimes (£20.72)	
4	Boye et al. [26]	Yes		Marginal increase in utilities: 0.023 for weekly instead of daily injection; 0.006 for increased dosing flexibility around mealtimes
5	Chancellor et al. [23]	Yes		Marginal increase in utilities for inhaled vs. injected insulin across a range of scenarios: 0.08, 0.04, 0.04, 0.02, 0.01
6	Coley et al. [20]	Yes	Monthly median (interquartile range) WTP (% of household income): For uncomplicated health states, WTP for home care is 5% (1%–20%) and hospital care is 10% (2%–25%). For serious health states, WTP for both hospital and home-hospital is 30%, with respective ranges of 1%–80% and 10%–75%.	Marginal increase in utilities: For uncomplicated and delayed health states, home treatment preferred to hospital by 0.001 (0.994–0.993). For serious health states, a combination of home-hospital treatment preferred to hospital alone by 0.003 (0.98–0.995)
7	Darba et al. [37]	Yes	Marginal WTP: Daily oral administration relative to daily subcutaneous injection (£127.07) or annual intravenous injection relative to daily subcutaneous injection (£163.76), and self-administration relative to administration at home with support (£52.79)	
8	Guimaraes et al. [13]	Yes	Mean WTP: £8.05 for oral administration vs. subcutaneous injection (long acting); £23.29 for inhaled administration and £2.21 for subcutaneous injection vs. oral administration (short acting)	
9	Hodgkins et al. [39]	Yes	Marginal WTP: Reduction in frequency of dosage from twice to once daily (£18.40 [Canada], £5.16 [Italy], £6.29 [United Kingdom], £0.85 [United States]), and reduction in quantity of tablets from two to one (−£2.80 [Canada], £2.60 [Italy], £4.24 [United Kingdom], £4.52 [United States])	
10	Jampel et al. [21]	Yes	Mean WTP: Reduction in dosing frequency from thrice to twice a day (£45.46), or thrice to once a day (£51.02), or one bottle of medicine instead of two (£46.58)	
11	Jendle et al. [32]	Yes	WTP (£/d) for subcutaneous injection relative to once daily oral administration of rosiglitazone (−£1.04) or glimepiride (−£0.65)	
12	Johnson et al. [30]	Yes		Mean marginal increase in utilities associated with oral relative to intravenous therapy: 0.362 (0.837–0.475)
13	Landfeldt et al. [33]	Yes	WTP: Prefilled pen vs. conventional syringe (£239.25), nonfilled pen vs. syringe (£183.43), prefilled pen vs. nonfilled pen (£55.83), and time for administration (£23.93 per saved minute)	

continued on next page

Table 3 – *continued*

S. no.	Author	Evidence	Form of evidence	
			£	Utility values
14	Marra et al. [14]	Yes	Mean WTP: Patients preferring home setting (89%) £577.20, patients preferring hospital setting (11%) £683.03	
15	McTaggart-Cowan et al. [15]	Yes	Monthly WTP: Frequency of administration—"as needed" preferred to once (−£7.79), twice (−£31.79), or thrice (−£60.93) daily; number of inhalers—one preferred to two (−£20.51) or three (−£18.88)	
16	Moia et al. [36]	Yes	Marginal monthly WTP: £34.56 for reduction in administration from twice to once daily; £66.60 for oral daily administration instead of weekly subcutaneous injection	
17	Osborne et al. [31]	Yes		Mean marginal increase in utilities: Oral therapy relative to 1) anchor state (0.10) [0.85–0.75] and 2) subcutaneous therapy (0.24) [0.85–0.61]
18	Ossa et al. [24]	Yes	Monthly WTP: Reduction in duration of administration (£0.15/min); method of administration—cannula instead of subcutaneous (£45.07) or intravenous (£8.41)	
19	Oteng et al. [16]	Yes	Mean WTP £: Smear test frequency every year (−£4.67) or every 3 y (£18.03); needing a HPV vaccine every 5 y (−£19.36) or never needing a booster (£18.03)	
20	Phillips et al. [22]	Yes	Marginal WTP: Ease of collection relative to drawing blood—oral swab (£24.68), urine sample (£22.04), or blood prick (£7.05). Testing location relative to a public health clinic—doctor's office (−£18.51) or at home (−£13.22)	
21	Porteous et al. [25]	Yes	WTP: £3.04 per 1-d increase in accessibility of services	
22	Roux et al. [17]	Yes	Marginal WTP: −£4.77 per additional 15- min travel time	
23	Wordsworth et al. [28]	No	Marginal WTP: £11.13 to increase screening frequency by 1 y	
24	Watson et al. [27]	Yes	Mean WTP: Method of screening—urine test (£7.36) preferred to perineal swab (−£3.64) or full pelvic examination (−£3.72)	
25	Sadri [18]	Yes	Monthly WTP: Inhaled vs. injectable insulin: £39.81 ± £25.91	
26	Sadri et al. [19]	Yes	Monthly WTP: Inhaled vs. injectable insulin: £93.48 ± £60.76	
27	Whitty et al. [29]	Yes	WTP: "Welfare gain" of £5.67 associated with clinical care and £65.88 associated with home care	

HPF, human papillomavirus; WTP, willingness to pay.

substantially—from £50.30 per month in Italy to £171.58 per month in the United Kingdom—but were also higher than initially hypothesized. It is possible that respondents who are not used to paying for treatment at the point of care will overstate values and the stated preferences may not be an accurate representation of WTP values. Other differences in the provision of health care between countries could also limit the generalizability of results.

A high proportion of studies identified (81.4%) reported patient preferences. Only 5 of the 27 studies reviewed reported preferences of the general population. This may have led to some level of bias because patients are more likely to overstate values for therapies that benefit them personally. Two studies by Sadri [18] and Sadri et al. [19] exemplify this: One [19] assessed diabetic patients' valuations of inhaled insulin, resulting in a mean WTP of £93.48 ± £60.76 (including the negative WTP values for patients who preferred injectable insulin). A subsequent study, 2 years later, of the general public, found a comparable estimate of £39.81 ± £25.91 for the same intervention [18]. Although results still express a preference for convenience, valuations by members of the public are less than half (44%) of what patients state they are willing to pay.

Issues commonly associated with specific types of value elicitation were evident in several studies. For example, studies using multiple preference elicitation methods found different results for each method. In Coley et al. [20], the SG component of the questionnaire generated much lower willingness to gamble than did the corresponding WTP question. This is a manifestation of an issue that has previously been associated with the SG technique, namely, that many people may not be willing to accept any possibility whatsoever of treatment failure when minor or temporary states of poor health are being valued [48]. An additional confounding factor was the presence of some possible framing issues surrounding the partially randomized ordering of the questionnaires: it is unclear from the study, for example, why the ordering of the category scaling and SG questions was randomized, yet the WTP component always came third.

Some limitations previously reported for WTP studies of health outcomes were also reported for these valuations of process, for example, results spanning a huge range of values for open-ended WTP questions [14], which can make it difficult to contextualize the value of the estimates obtained.

Limitations within some studies can be attributed to their publication date. The oldest study in this review is by Johnson et al. [30], predating the development of some of the instrumental sensitivity with respect to process attributes that is evident in more recent studies. This is acknowledged in other articles from the period, such as Ryan et al. [49], who refer to "the insensitivity of the WTP instrument to pick up the importance of particular process attributes." Similarly, Donaldson and Shackley [7] were unable to establish the existence of process utility despite respondents claiming that "process" factors were important to them. They suggest that this may be because process utility exists in a form that was not compatible with their chosen study design [7]. More recent studies show much stronger evidence in favor of the existence of process utility, which can reasonably be attributed to advancements in study design.

A recent study looking at the incorporation of process utility in general into a QALY framework found results very similar to those reported here: all 15 studies reviewed showed evidence of utility-based process utility [11]. The review was restricted to articles showing empirical measures of process utility, that is, those anchored on a scale of 0 representing death and 1 representing full health. This search strategy would not pick up those DCE articles involving a cost component, which comprise the majority of this review's findings. The authors acknowledge the potential limitations of their study, some of which are shared by this review, largely due to the lack of consistent terminology and reporting of process-utility–related work. They conclude that there is currently no sound methodological framework for the incorporation of "process" into QALY frameworks and suggest the exploration of alternative methodologies that may be appropriate for the valuation of nonhealth outcomes, perhaps used in combination with more traditional approaches [11]. There is a growing recognition that DCEs, for example, could potentially contribute to outcome measurement [50]. Brennan and Dixon [11] also identify alternative methods that may warrant further research, for example, the use of psychometric approaches, comparative studies with other patient-reported measures, or the use of a process-related "bolt-on" to an existing preference-based measure. Our findings support the need for alternative methodologies to be developed, which may include DCE, and the need for a more consistent approach to the valuation of process utility.

Conclusions

The conclusion to be drawn from the studies reviewed is that convenience-related process utility does exist, although this preference may be small in some cases. The studies reviewed encompass a wide range of countries, methodologies, disease areas, and attributes encompassed in the study. The fact that such a large majority of studies (all but one) show the existence of some level of preference for convenience despite substantial changes in key factors such as study design and attribute description is a promising indication of the robustness of such a preference. The evidence from this review suggests that process utility derived from improvements in convenience-related aspects of health care may be small in magnitude; however, the estimates provided in the studies are likely to be hampered by difficulties in applying standard methods of health valuation to value process characteristics.

One of the most striking factors of this review is the high proportion of studies that use a DCE methodology, using some kind of financial attribute to derive a WTP estimation. The relatively small proportion of studies using traditional forms of utility assessment is to be expected, given their inherently longer-term scope: attempting to value convenience in the context of potential instantaneous death (as per the SG) is very likely to induce ceiling effects, given the difference in magnitude between the seriousness of the two concepts. The wide range of methodologies reported makes it difficult to meaningfully compare estimates from the different sources. In addition, most studies used a variant of WTP methods or a cost attribute in a DCE to obtain monetary estimates of value. Although these results can legitimately be used in a cost-benefit analysis, they cannot currently be incorporated into a QALY-based cost-effectiveness framework. This leads to the issue of how these data can be appropriately used in terms of their potential effect on health care policy. Given the wide range of methodologies reported in this review, each associated with its own potential for bias and subjectivity, there seems to be a strong case to be made for having a single recommended method of valuation with which to examine the issue.

If process utility is to be incorporated routinely into HTA and used to inform decision making, improved and consistent methodologies are required. Growing interest in nonhealth outcomes from HTA agencies and researchers, as evidenced by the reference to process utility in NICE guidelines [3], makes refinement of existing methodologies or the development of new methodologies increasingly urgent. Based on the results of this review, there is a need for a more in-depth consideration of the most appropriate methodologies to be used to ensure optimal resource allocation.

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Supplemental Materials

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