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A Systematic Review of Health State Utility Values in the Plastic Surgery Literature

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Background: Cost-utility analyses assess health gains acquired by interventions by incorporating weighted health state utility values (HSUVs). HSUVs are important in plastic and reconstructive surgery (PRS) because they include qualitative metrics when comparing operative techniques or interventions. We systematically reviewed the literature to identify the extent and quality of existing original utilities research within PRS.
Methods: A systematic review of articles with original PRS utility data was conducted in accordance with the Preferred Reporting Items for a Systematic Review and Meta-Analysis guidelines. Subspecialty, survey sample size, and respondent characteristics were extracted. For each HSUV, the utility measure [direct (standard gamble, time trade off, visual analog scale) and/or indirect], mean utility score, and measure of variance were recorded. Similar HSUVs were pooled into weighted averages based on sample size if they were derived from the same utility measure.
Results: In total, 348 HSUVs for 194 disease states were derived from 56 studies within seven PRS subspecialties. Utility studies were most common in breast (n = 17, 30.4%) and hand/upper extremity (n = 15, 26.8%), and direct measurements were most frequent [visual analog scale (55.4%), standard gamble (46.4%), time trade off (57.1%)]. Studies surveying the general public had more respondents (n = 165, IQR 103–299) than those that surveyed patients (n = 61, IQR 48–79) or healthcare professionals (n = 42, IQR 10–109). HSUVs for 18 health states were aggregated.
Conclusions: The HSUV literature within PRS is scant and heterogeneous. Researchers should become familiar with these outcomes, as integrating utility and cost data will help illustrate that the impact of certain interventions are cost-effective when we consider patient quality of life. *(Plast Reconstr Surg Glob Open 2021;9:e3944; doi: 10.1097/GOX.0000000000003944; Published online 29 November 2021.)*

INTRODUCTION

Economic evaluation research is a crucial element of cost-effective surgical decision-making and the minimization of unnecessary healthcare spending.[1] Although several types of economic evaluation are commonly reported, a major advantage of using cost-utility analyses (CUA) is the assessment of health benefits in terms of patient health states rather than cost alone.[1,2] CUAs incorporate quantitative and qualitative metrics when comparing operative techniques or interventions with nonoperative management. These analyses are particularly important in plastic and reconstructive surgery (PRS), as some of the most significant improvements after interventions are related to increasing patient quality, rather than quantity, of life.[3–5]

The methodology for completing a CUA is complex. To identify if the health gains acquired by interventions are justified by associated costs, clinical outcomes are measured using quality-adjusted life years. Quality-adjusted life years measure disease burden in terms of survival and health-related quality of life by assessing an individual's preference for living in a given health state.[2,6,7] These preference weights are otherwise known as health state utility values (HSUVs) and are typically scaled from 0 (death) to 1 (ideal

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health).[8] Metrics to derive HSUVs vary and include direct and indirect survey instruments that can be administered to patients, the general public, and/or healthcare providers.[8,9] Direct measures include standard gamble (SG), time trade off (TTO), and visual analog scale (VAS), with variation within measures based on study design. Depending on the instrument, individuals are asked to gamble on a hypothetical intervention that may cause perfect health or death (SG), trade part of future life for a period of shorter, perfect health (TTO), or rate a health state on a visual scale from 1 to 100 (VAS).[10] Indirect measures, in contrast, obtain preference weights by using prespecified health state classification systems [ie, the Health Utility Index,[11] Short Form-6-Dimension (SF-6D),[12] EuroQol 5-dimension questionnaire (EQ-5D),[13] among others]. Quality-adjusted life years are then calculated by multiplying the life-years obtained from an intervention by its HSUV.[14]

In a systematic review of HSUVs in the surgical literature in 2004, only three studies within PRS were included.[14] The importance of HSUVs in PRS cost analyses has been emphasized since that time[1,15]; however, widespread implementation has been slow.[16] The purpose of this study was threefold: (1) To systematically review the PRS literature and evaluate the state of HSUV research, (2) to aggregate this data where appropriate into a useable database of HSUVs that can be referenced by investigators interested in performing CUAs, and (3) to critically appraise the quality of the included studies using a pre-established set of criteria.[17]

Takeaways

Question: A systematic review of the literature to identify the extent and quality of existing original health state utility value (HSUV) research within PRS.

Findings: The PRS HSUV literature is scant and heterogeneous. Fifty-six studies within seven PRS subspecialties derived 348 HSUVs for 194 disease states. Only 18 health states were able to be aggregated.

Meaning: Integrating utility and cost data will help illustrate that the impact of certain interventions is cost effective when we consider quality of life.

METHODS

Inclusion and Exclusion Criteria

The systematic review was conducted in accordance with the Preferred Reporting Items for a Systematic Review and Meta-Analysis checklist.[18] (See **figure, Supplemental Digital Content 1**, which shows the Preferred Reporting Items for a Systematic Review and Meta-Analysis 2020 checklist. **http://links.lww.com/PRSGO/B849**.) Articles were considered eligible for inclusion if they were full-text and reported original HSUVs for health states associated with PRS procedures. PRS was defined according to the American College of Surgeons as procedures involving the "repair, reconstruction, or replacement of physical defects of form or function involving the skin, musculoskeletal system, cranio and maxillofacial structures, hand, extremities, breast and trunk, and external genitalia."[19] Abstracts alone, editorials, commentaries, and systematic reviews were excluded, as were economic analyses that did not utilize HSUVs or did not report derived HSUVs.

Search Strategy

A literature search was conducted on 1/19/2021 within the MEDLINE, Embase, Cochrane, Web of Science, Scopus, and CINAHL electronic databases. Search strategies were individualized to the databases as appropriate. Key search terms were derived and adapted from previously published recommendations[17] as Medical Subject Headings (MeSH) terms do not cover all HSUVs. (**See figure, Supplemental Digital Content 2**, which shows the systematic review search strategies checklist. **http://links.lww.com/PRSGO/B850**.) Titles and abstracts were screened by two reviewers (ANC and KK), and records were excluded if they did not meet inclusion criteria. The bibliographies of any systematic reviews on HSUVs were reviewed before exclusion, as well as all those of the included studies, to ensure that no relevant studies were missed. Any disagreements were resolved by the reviewers. The full text of records not excluded at this stage were retrieved and further screened against our inclusion criteria.

Data Extraction

Characteristics of the included studies were extracted with predefined variables, which included year of publication, publication journal, study country, subspecialty, respondent sample size, and whether or not a CUA was performed. For each HSUV, the utility measures [SG, TTO, VAS, EQ-5D, Health Utility Index, SF-6D, 15D (15 Dimension), QWB (Quality of Well Being Index), AQoL (Assessment of Quality of Life)], point estimate (mean), and measure of variance (SD/confidence interval/interquartile range) were recorded. If multiple HSUVs were derived for the same health state, they were all collected.

Quality Reporting

The quality of each study was evaluated through criteria proposed by Papaioannou et al.[17] Each study was evaluated for (1) sample size of 100 or more; (2) description of respondent selection/recruitment; (3) description of inclusion/exclusion criteria; (4) response rate of 60% or more; (5) reporting of the amount and reasons of loss to follow-up; (6) reporting of missing data and methods to deal with missing data; and (7) appropriateness of measure. The individual scores were summed for an overall score (0–7), with higher scores indicating higher quality.

Statistical Analysis

Standard descriptive statistics were used to report counts and frequencies of categorical data. Utility scores were pooled into a weighted average and variance based on sample size if scores existed for the same health state and were derived from the same utility metric. For ease of interpretation, the range of HSUVs derived for each health state was represented graphically.

RESULTS

Study Selection

The search strategy identified 1298 articles (Fig. 1). After removing duplicates, 1214 articles were scanned by title/abstract, and 1110 articles were excluded for either having the wrong patient population (not PRS), or the wrong outcomes (no original HSUVs). Seventy-one articles were retrieved and reviewed in full. An additional 15 records were excluded during the full-text review, leaving 56 studies.

The study characteristics are summarized in Table 1. Content included musculoskeletal (MSK)/abdominal wall reconstruction (n = 1, 1.79%),[20] breast (n = 17, 30.4%),[21–37] skin/body contouring (n = 4, 7.14%),[38–41] facial plastics (n = 13, 23.2%),[42–54] hand/upper extremity (n = 15, 26.8%),[55–69] pediatrics/craniofacial (n = 4, 7.14%),[70–73] and lower extremity (n = 2, 3.57%).[74,75] Direct measurements were most frequent (TTO: n = 32, 57.1%; VAS: n = 31, 55.4%; SG: n = 26, 46.4%). Indirect methods were less common (n = 12, 21.4%); however, of these, the EQ-5D was used most frequently (n = 6, 50%). Twenty-eight of the studies used one measurement to derive HSUVs, and 28 utilized more than one measurement, thus providing multiple HSUVs for a single health state.

Respondent populations included patients, general public, or healthcare professionals (see Table 1). Forty-one studies surveyed one of these populations (73.2%), while 15 reported HSUVs from a combination of these groups (26.8%). When a combination of groups was utilized, studies reported overall HSUVs as well as HSUVs for each population. Studies surveying the general public had the most respondents (n = 165, IQR 103–299), followed by patients (n = 61, IQR 48–79) and healthcare professionals (n = 42, IQR 10–109). The sample sizes varied widely from nine to 355 with a median of 101 respondents per study. Twenty studies included a CUA in addition to deriving original HSUVs.[20,22,24,26,27,30–32,34,36,37,51,56,57,60,62,66,68,69,73]

Quality Assessment

In all of the studies included, the utility metric was considered appropriate by the authors (100%), and 58.9% had a sample size greater than 100. Nearly all described how respondents were recruited (98.2%) and the inclusion/exclusion criteria (94.6%). True response rates were difficult to ascertain in studies that surveyed the general public, as many sent electronic surveys or publicly advertised and therefore included whomever responded. An estimated 13 studies clearly stated response rates greater than 60%.[22–24,29–32,51,55,56,60,61,64] Where appropriate, most longitudinal studies reported reasons or loss to follow up (n = 11 studies); however, few studies reported the extent of missing data and how it was handled (3.57%). The summed scores are found in Table 1, and the individual scores in Supplemental Digital Content 3. (**See figure, Supplemental Digital Content 3,** which shows individual and summed quality assessment criteria. **http://links.lww.com/PRSGO/B851.**)

HSUVs

A total of 348 original HSUVs for 194 health states were retrieved from the 56 studies included in this analysis.

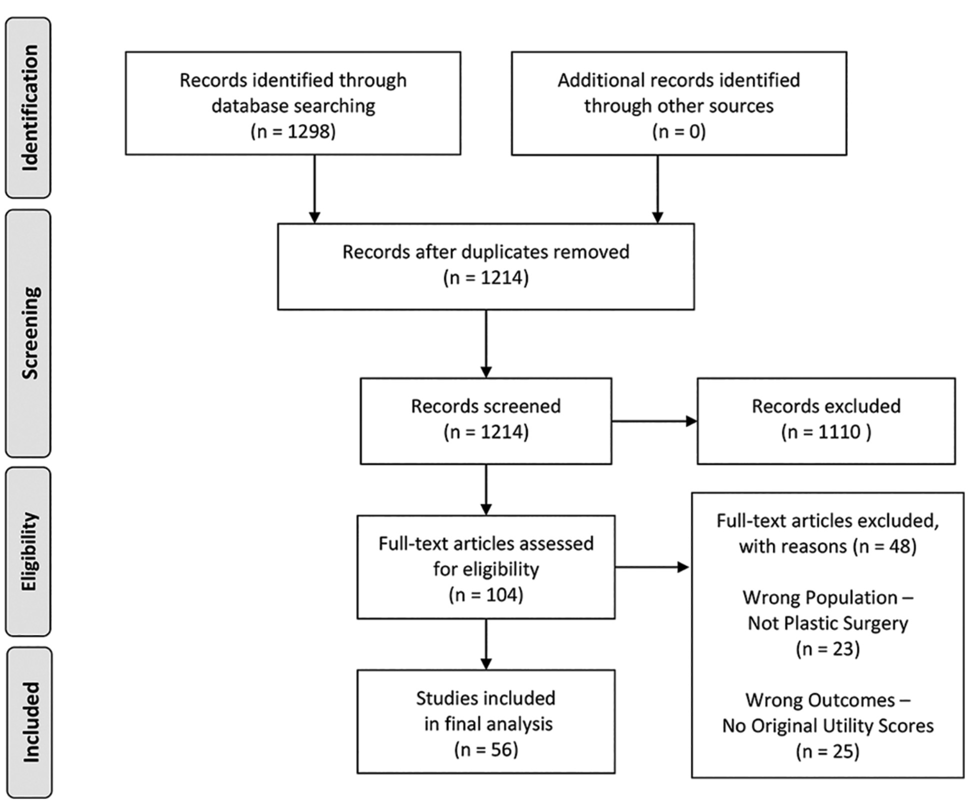

Fig. 1. Preferred Reporting Items for a Systematic Review and Meta-Analysis flow diagram.

Table 1. Studies Deriving Original HSUVs in the PRS Literature (n = 56)

PRS Specialty	Author	Year	Country	Journal	Health State	Instrument	Sample Size	Respondents: General Public	Respondents: Healthcare Professionals	Respondents: Patients	CUA	QA*
Abdominal wall	Fischer et al[20]	2016	USA	*Plastic and Reconstructive Surgery*	Incisional hernia	VAS	300	x			Yes	3
Body contouring	Ibrahim et al[40]	2014	USA	*Annals of Plastic Surgery*	Excess arm skin	VAS, TTO, SG	118	x	x		No	4
	Sinno et al[38]	2011	USA	*Aesthetic Plastic Surgery*	Excess skin after massive weight loss	VAS, TTO, SG	100	x			No	3
	Izadpanah et al[39]	2013	USA	*Annals of Plastic Surgery*	Thigh lift	VAS, TTO, SG	112	x	x		No	2
	Sinno et al[41]	2012	USA	*Otolaryngology Head and Neck Surgery*	Excess neck skin	VAS, TTO, SG	104	x			No	3
Breast	Ibrahim et al[33]	2015	USA	*Plastic Surgery*	Breast ptosis	VAS, TTO, SG	118	x	x		No	7
	Araújo et al[31]	2014	Brazil	*Aesthetic Surgery Journal*	Breast hypertrophy	SF-6D	58			x	Yes	3
	Saariniemi et al[24]	2012	Finland	*Journal of Plastic Reconstructive and Aesthetic Surgery*	Breast hypertrophy	SF-6D	62			x	Yes	4
	Saariniemi et al[23]	2008	Finland	*Journal of Plastic Reconstructive and Aesthetic Surgery*	Breast hypertrophy	SF-6D, 15D	29–35			x	No	5
	Thoma et al[29]	2007	Canada	*Plastic and Reconstructive Surgery*	Breast hypertrophy	EQ-5D, Health Utility Index	49			x	No	6
	Tykkä et al[22]	2008	Finland	*Journal of Plastic Reconstructive and Aesthetic Surgery*	Breast hypertrophy	15-D	80			x	Yes	5
	Kerrigan et al[35]	2000	USA	*Plastic and Reconstructive Surgery*	Breast hypertrophy	VAS, SG, EQ-5D	47	x		x	No	5
	Chang et al[21]	2001	USA	*Plastic and Reconstructive Surgery*	Breast hypertrophy	VAS, TTO, SG	355	x			No	3
	Sinno et al[28]	2014	USA	*Journal of Reconstructive Microsurgery*	Unilateral mastectomy defect	VAS, TTO, SG	140	x	x		No	4
	Sinno et al[25]	2013	USA	*Breast*	Bilateral mastectomy defect	VAS, TTO, SG	120	x	x		No	3
	Chatterjee et al[26]	2013	USA	*Plastic and Reconstructive Surgery*	Autologous reconstruction	VAS or TTO	10		x		Yes	4
	Chatterjee et al[34]	2015	USA	*Plastic and Reconstructive Surgery*	Autologous reconstruction	VAS	21		x		Yes	4
	Thoma et al[36]	2003	Canada	*Microsurgery*	Autologous reconstruction	VAS	33		x		Yes	4
	Thoma et al[37]	2004	Canada	*Plastic and Reconstructive Surgery*	Autologous reconstruction	VAS	32		x		Yes	4
	Grover et al[27]	2013	USA	*Plastic and Reconstructive Surgery*	Autologous and implant reconstruction	VAS	9		x		Yes	4
	Krishnan et al[30]	2013	USA	*Plastic and Reconstructive Surgery*	Implant reconstruction	VAS	10		x		Yes	3
	Krishnan et al[32]	2014	USA	*Journal of Plastic Reconstructive and Aesthetic Surgery*	Implant reconstruction	VAS	10		x		Yes	3

(Continued)

Table 1. (*Continued*)

PRS Specialty	Author	Year	Country	Journal	Health State	Instrument	Sample Size	Respondents: General Public	Respondents: Healthcare Professionals	Respondents: Patients	CUA	QA*
Facial plastics	Dey et al[49]	2016	USA	*JAMA Facial Plastic Surgery*	Facial defect reconstruction	VAS, SG	200	x			No	6
	Sinno et al[42]	2010	Canada	*Plastic and Reconstructive Surgery*	Facial disfigurement	VAS, TTO, SG	256	x	x		No	4
	Chuback et al[48]	2015	Canada	*Burns*	Facial disfigurement	TTO, SG	75	x	x	x	No	4
	Gadkaree et al[54]	2019	USA	*JAMA Facial Plastic Surgery*	Nasal obstruction/ septorhinoplasty	EQ-5D	160–463			x	No	4
	Oladokun et al[51]	2018	Germany	*Aesthetic Plastic Surgery*	Nasal deformity/ septorhinoplasty	SF-6D	67			x	Yes	4
	Gadkaree et al[44]	2019	USA	*JAMA Facial Plastic Surgery*	Nasal obstruction/ septoplasty	EQ-5D	185–278		x		No	4
	Kumar et al[46]	2020	USA	*Facial Plastic Surgery and Aesthetic Medicine*	Nasal deformity/ cosmetic rhinoplasty	VAS, SG	167	x			No	4
	Sinno et al[43]	2012	USA	*Annals of Plastic Surgery*	Repeat rhinoplasty	VAS, TTO, SG	128	x	x		No	2
	Faris et al[45]	2019	USA	*Laryngoscope*	Nasal defect/rhinectomy	VAS, TTO, SG	273	x			No	2
	Su et al[50]	2017	USA	*JAMA Facial Plastic Surgery*	Facial paralysis	VAS, TTO, SG	348	x			No	4
	Faris et al[52]	2018	USA	*JAMA Facial Plastic Surgery*	Facial paralysis	VAS, TTO, SG	298	x			No	4
	Sinno et al[47]	2012	Canada	*Annals of Plastic Surgery*	Facial paralysis	VAS, TTO, SG	101	x	x		No	5
	Abt et al[53]	2018	USA	*JAMA Facial Plastic Surgery*	Alopecia	VAS, TTO, SG	308	x			No	4
Hand/ upper extremity	Ram et al[64]	2009	USA	*The Journal of Hand Surgery*	Tetraplegia	TTO	118		x		No	4
	Snoek et al[55]	2005	Netherlands	*Archives of Physical Medicine and Rehabilitation*	Tetraplegia	TTO	47			x	No	4
	Cavaliere et al[63]	2008	USA	*The Journal of Hand Surgery*	Rheumatoid arthritis	TTO	73		x		No	4
	Cavaliere et al[66]	2010	USA	*The Journal of Hand Surgery*	Rheumatoid arthritis	TTO	109		x	x	Yes	4
	Cavaliere et al[67]	2010	USA	*Hand*	Rheumatoid arthritis	TTO	109		x		No	3
	Fernandez-de-Las-Peñas et al[60]	2019	Spain	*The Journal of Orthopaedic and Sports Physical Therapy*	Carpel tunnel syndrome	EQ5D	60			x	Yes	3
	Korthals-de Bos et al[56]	2006	Netherlands	*BMC Musculoskeletal Disorders*	Carpel tunnel syndrome	EQ5D	70–83			x	Yes	4
	Atroshi et al[61]	2007	Sweden	*The Journal of Hand Surgery*	Carpel tunnel syndrome	SF-6D	100			x	No	4
	Alolabi et al[58]	2015	Canada	*The Journal of Hand Surgery*	Hand amputation/ transplantation	TTO, SG	12–30	x		x	No	4
	Chung et al[68]	2010	USA	*Plastic and Reconstructive Surgery*	Hand amputation/ transplantation	TTO	100		x		Yes	4
	Efanov et al[59]	2018	Canada	*Journal of Reconstructive Microsurgery*	Thumb amputation/ free toe flap	TTO, SG	30			x	No	4
	Song et al[57]	2012	USA	*The Journal of Hand Surgery*	Ulnar neuropathy	TTO	102	x			Yes	6
	Koenig et al[65]	2009	USA	*The Journal of Bone and Joint Surgery*	Distal radius fracture	TTO	51	x			No	4
	Davis et al[62]	2006	USA	*Plastic and Reconstructive Surgery*	Scaphoid fracture	TTO	50		x		Yes	4
	Chen et al[69]	2011	USA	*The Journal of Hand Surgery*	Dupuytren's contracture	SG	50	x			Yes	3
Lower extremity	Sinno et al[75]	2014	USA	*Annals of Plastic Surgery*	Unilateral lower extremity lymphedema	VAS, TTO, SG	144	x			No	5
	Chung et al[74]	2011	USA	*Annals of Plastic Surgery*	Open tibial fracture	SG	65		x	x	No	5
Pediatrics/ craniofacial	Wehby et al[70]	2006	USA	*The Cleft-palate Craniofacial Journal*	Cleft lip and palate	VAS	133		x		No	4
	Sinno et al[71]	2012	USA	*Plastic and Reconstructive Surgery*	Cleft lip and palate	VAS, TTO, SG	110	x			No	6
	Almadani et al[73]	2020	Canada	*Journal of Craniofacial Surgery*	Mandibular and maxillary hypoplasia	VAS, TTO	162	x			Yes	4
	Kuta et al[72]	2017	Canada	*Journal of Neurosurgery: Pediatrics*	Scaphocephaly	VAS, TTO, SG	118	x	x		No	4

*Summed Quality Assessment Scores (from Papaionannou et al. 2013[17]).

Individual HSUVs were organized by subspecialty. HSUVs along with the corresponding utility metric, respondent sample size, mean respondent age, and variance, can be found in Supplemental Digital Content 4. (**See figure, Supplemental Digital Content 4,** which shows a database of original and aggregated health state utility values by plastic and reconstructive surgery subspecialty. **http://links.lww.com/PRSGO/B852**.)

Twenty-three studies (41.1%) reported preintervention and postintervention HSUVs,[20,22,24,27,29,31,44,45,48–54,57,58,61,63,67–69,73] and 15 (26.8%)[20,26,27,30,32,34,36,37,57,62,63,66,68,69,74] reported HSUVs associated with procedure-related complications. Three studies (5.3%) looked at HSVUs after aesthetic procedures, including nasal deformity and cosmetic rhinoplasty,[46] hair loss and hair transplant,[53] and thigh lifts.[39] HSUVs were most commonly derived in the breast literature, with the most common disease state being breast hypertrophy with or without reduction mammoplasty (n = 7 studies).[21–24,29,31,35] In the studies that derived HSUVs for breast reconstruction, the respondent populations were healthcare professionals only (plastic surgeons, n = 9–33), and all included a CUA.[26,27,30,32,34,36,37] Utilities for hand disease states and related hand surgery procedures were the next most common, and CUAs were performed in seven of 15 studies.[56,57,60,62,66,68,69] MSK/abdominal wall reconstruction, skin/body contouring, pediatrics/craniofacial, and lower extremity had the least number of studies deriving HSUVs, and only two studies from these four specialties included CUAs.[20,73] The ranges of HSUVs for preintervention and postintervention disease states are represented in Figure 2.

Only 18 disease states had multiple HSUVs derived from the same utility metric that were eligible for aggregation. Tetraplegia had the lowest aggregated HSUV (0.47 ± 0.3), whereas patients 1-year after functional septoplasty/septohinoplasty had the highest aggregated HSUV (0.92 ± 0.14). (**See Supplemental Digital Content 4, http://links.lww.com/PRSGO/B852**.)

DISCUSSION

This is the first systematic review to examine the prevalence and quality of original HSUV literature in PRS. Our results demonstrate that there has been a small and steady increase in the number of publications per year dedicated to utility score outcomes (Fig. 3). Unfortunately, recent literature has found that CUAs, despite their robust and comprehensive methodology, remain the least frequently reported type of economic evaluation.[76] This houses an immense opportunity for the PRS community. As many of the conditions we treat are measured by subjective endpoints, and very few are life-limiting or life-threatening, there can be a false sense of "less importance" by healthcare policy drivers and insurance agencies. In turn, this limits coverage, funding, and increases patient wait times for surgery,[77] particularly in countries with socialized medicine, like Canada and the United Kingdom, where resource allocation is dictated by a single-payer, government-run healthcare system. Characterizing the health-burden associated with PRS disease states, and the magnitude of improvement following intervention, may therefore have the ability to affect the distribution of health care resources. Moreover, quantifying and understanding the results of these health states may help individual clinicians guide medical and surgical decision-making and aid in patient counseling.

It is postulated that the lack of original HSUV data in the literature is partly due to the fact that direct measurement of HSUVs can be complex and costly.[78] We hypothesized that pooling existing HSUVs would enable us to create a resource database that would facilitate the comparison of various pre and postoperative PRS disease states. What we found, however, was a high degree of heterogeneity in the description of health states tested, the utility metric used, and the respondent populations. We felt that grouping a majority of the HSUVs was therefore inappropriate.[79] Although we were unable to aggregate all the scores as initially planned, the compilation of collected data still allowed us to create and critically analyze a database of HSUVs. From this, we present several conclusions regarding the state of current PRS HSUV literature and highlight several points that may help the individual reader interested in conducting HSUV and CUA research.

Utility Measures

It has been previously demonstrated that utilizing different measures to derive HSUVs may yield conflicting results.[80,81] Specifically, the use of VAS over SG or TTO and indirect over direct methods, have resulted in lower utility values for a range of disease states.[78,80] These findings were corroborated here. In three separate studies that derived HSUVs using VAS, TTO, and SG for patients with moderate facial paralysis, aggregated VAS scores were on average lower (0.65 ± 0.2) than TTO (0.81 ± 0.22) or SG (0.82 ± 0.2). The same was true for patients with severe facial paralysis [VAS (0.52 ± 0.21), TTO (0.72 ± 0.27), SG (0.76 ± 0.24)]. These discrepancies were also noted in postoperative health states. Faris et al compared direct measurements for 298 patients undergoing facial re-animation, and reported VAS scores of 0.74 ± 0.19, but TTO and SG scores of 0.84 ± 0.19 and 0.84 ± 0.21, respectively.[52] Similarly, Izadpanah et al found that HSUVs for patients after thigh lift procedures were 0.77 ± 0.15 if patients completed VAS, but 0.9 ± 0.11 and 0.89 ± 0.14 if they completed TTO or SG.[39] This is important as the potential incremental gains for an intervention are dependent on baseline values, and a difference of even 0.1 may alter the results of a CUA to favor one intervention or another. The variability and discrepancies between methods may therefore preclude the use of a single method to analyze cost-effectiveness of an intervention.[81,82] Larger repositories of utility values are needed for comparative and value analyses. For those interested in conducted HSUV research, utilizing and aggregating multiple methods to derive HSUVs should be considered, as this may provide a more accurate HSUV for inclusion in a CUA.

Respondents

According to the first Panel on Cost-Effectiveness in Health and Medicine, the use of "societal perspective" best facilitated the goals of making comparisons across

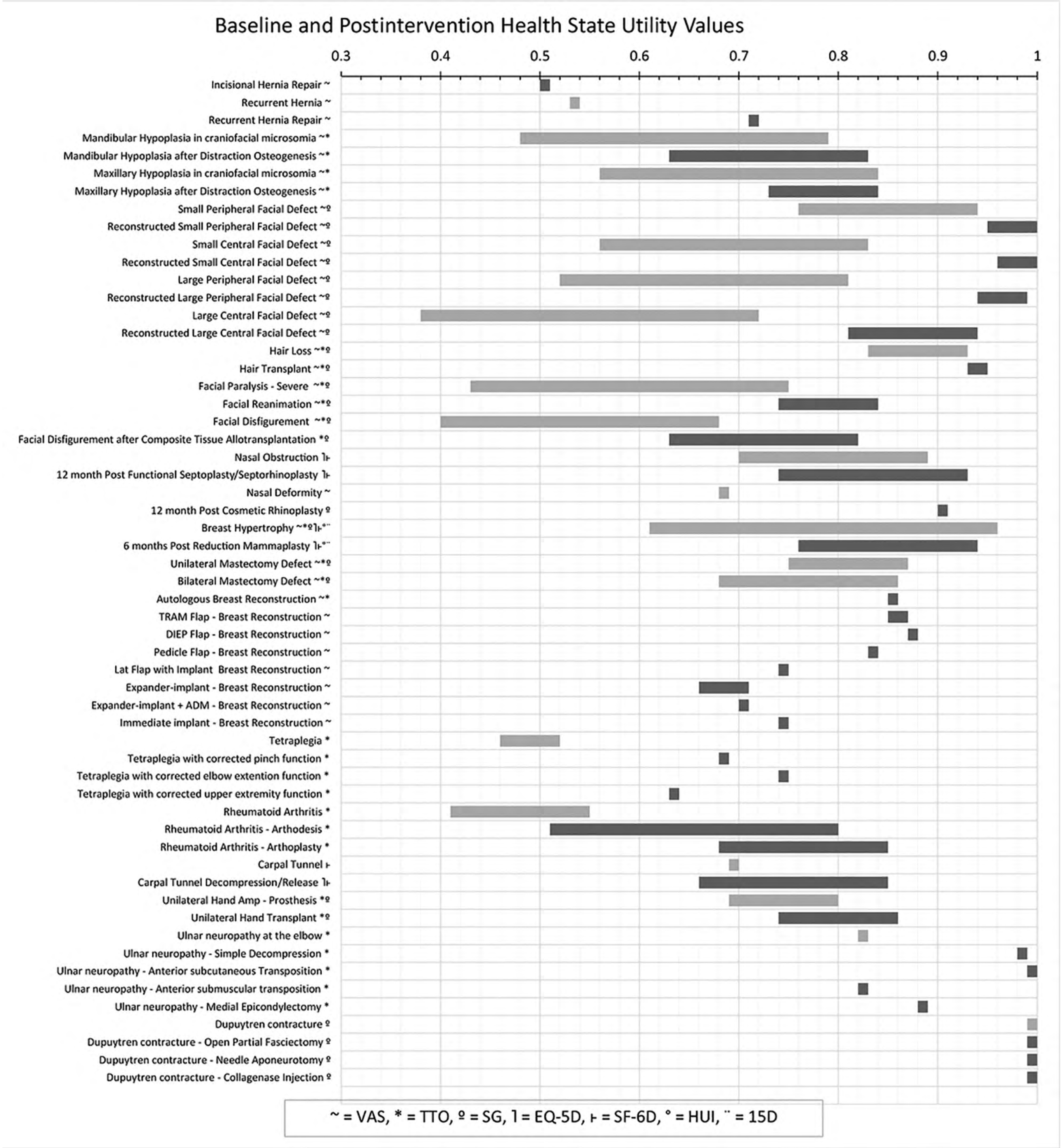

Fig. 2. Range of baseline and postintervention HSUVs.

interventions and patient groups, and recommended the use of the general public as respondents when possible.[83] In the second panel, the authors recommend both societal and healthcare sector perspectives be reported.[84] The healthcare sector is utilized based on the rationale that individuals can personally or professionally relate to the disease state in question. However, research has noted that patients who have adapted to their chronic health state may experience a better health-related quality of life than perceived by others leading to higher HSUVs.[85] No clear trends in reported HSUVs by respondent populations were elicited in this review. Importantly, none of the studies that included CUAs in this review utilized societal and healthcare perspectives. Admittedly, choice of respondent population may be dictated by resource availability, as utilizing physicians and medical students may be the most time-efficient and cost-effective, however readers who seek to conduct HSUV and CUA research should aspire

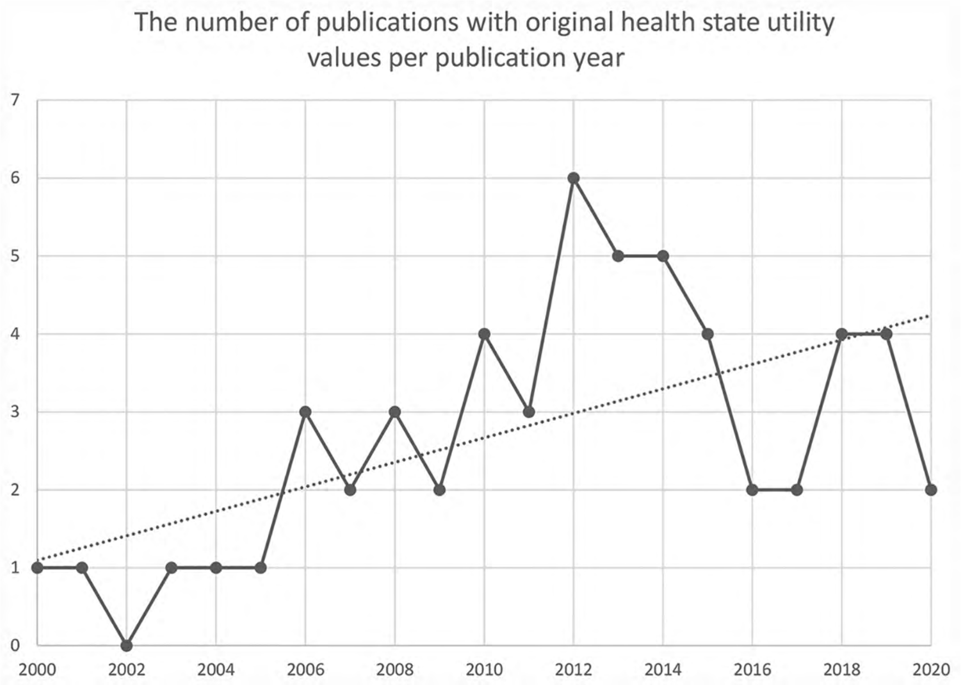

Fig. 3. The number of publications with original HSUVs per publication year.

to adhere to the panel's recommendation for including these populations, as it may improve the quality of future research. Further, studies that survey multiple respondent populations should report separate HSUVs for each population to increase transparency of the results.

Cost Analyses

In two systematic reviews of economic evaluations in PRS conducted in 2014 and 2021, six and 10 CUAs were reported in the literature.[16] Our review identified 20 CUAs; however, readers should be aware that the true incidence of CUAs in the PRS literature may be underestimated in this and other works as the lack of medical subject heading (MeSH) terms makes it difficult to systematically review this literature. Two additional important studies warrant mentioning. In 2013 and 2014, Thoma et al published the first randomized control trial in parallel to a CUA, and found variations in economic value of two mammaplasty techniques depending on the perspective used (societal/patient versus ministry of health).[86,87] These results were particularly important in elucidating why utility measurement is so important in PRS while additionally highlighting that using a clinical trial alongside an economic evaluation is more transparent and intuitive to clinicians. Researchers are encouraged to report their derived HSUVs and include cost analyses, as describing and integrating these will help streamline future utilities research and demonstrate if interventions are cost-effective.

Limitations

A limitation of this study, and of all studies that attempt to systematically review utility research, is the lack of MeSH terms for common HSUVs. We utilized Papaionannou et al's guide for systematically reviewing the HSUV literature[17] and cross-referenced to collect an unbiased and inclusive selection of studies, but acknowledge that literature may have been missed in our search. Established MeSH terms would facilitate and improve the accuracy of similar reviews in the future. Further, details on the extent of missing data and how this missing data was accounted for when deriving utility measures were not commonly reported amongst these studies. This must be considered in interpreting the included results, and the statistical validity of future work would be substantiated by the inclusion of this information. Two additional quality metrics, loss to follow up and response rate, were difficult to assess in many of the included studies, making our summed quality analysis challenging to interpret. Losing respondents to follow-up was not relevant to studies that were cross-sectional in nature, and true response rate was not able to be calculated in studies that recruited members voluntarily based on advertisements. The heterogeneity of study type therefore negatively influenced our ability to make conclusions regarding the quality of the study group as a whole. Studies utilizing patient populations in a longitudinal manner should continue to report response rate and follow up metrics as this information increases the transparency of the work.

CONCLUSIONS

This systematic review has identified gaps in the current HSUV literature as well as the need for standardization of methodologic tools and characteristics of respondent populations to limit variation and increase the generalizability and validity of utility scores. The importance of continuing to conduct and refine HSUV research in the

PRS community cannot be understated, as HSUVs are objective means to demonstrate that PRS procedures are impactful.[1] Integrating these values with cost data will help illustrate that the certain interventions are cost-effective when we consider health-related quality of life.

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