

G99: How can we capture the physical and psychological impact of orthopedic infections on patients?

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Response/Recommendation: There are no standard outcome measures to capture the physical and psychological impact of orthopedic infections. Currently, both general and disease-specific measures are used depending on the anatomical location and subspecialty practice preferences. Until universal outcome measures are adopted, providers should use outcome measures recommended by their respective societies.

Level of Evidence: Limited

Delegate Vote:

Rationale:

Orthopedic infections are a devastating complication of orthopedic surgery. Examples of common orthopedic infections include periprosthetic joint infection (PJI), fracture related infection (FRI), and spine infection to name a few. The goal of treating a patient with an orthopedic infection is to maximize the patient's physical and psychological health by selecting the best surgery and treatment course for that patient. Without specific outcome instruments to measure the impact of a surgery on patients' physical and psychological health, care teams are left without evidence-based metrics to guide care.

Patient Reported Outcome Measurements are used by orthopedic surgeons to monitor the impact of specific orthopedic procedures on patients' overall health and functional outcomes. Some examples of these include the HOOS and KOOS JR scores and the Oswestry Disability Index. Unfortunately, there are no standardized metrics to capture the physical and psychological impact of orthopedic infections on patients, but providers who care for these patients recognize the enormous burden such infections impose on patients and their families. If there were standardized metrics to compare physical and psychological outcomes, orthopedic surgeons could make better evidence-based recommendations for the patient.

A review of articles from 2007 to 2024 was performed. A total of 34 studies met the search criteria. Of the 34 studies, 28 studies focused on PJI, 3 studies examined spine infections, 1 study compared spine infections and PJI, 1 study examined FRI alone, and 1 study compared FRI and PJI. The majority of the PJI studies sought to determine which surgical strategy results in better physical and/or psychological outcomes for patients.

Multiple outcome measures were used including physical, psychological, and overall quality of life outcome measures. Of note, many of the quality-of-life outcome measures included both physical and psychological components so there was overlap. The most common physical outcome measures examined were WOMAC (4 studies), OHS and/or OKS (5 studies), VAS (4 studies), HOOS and/or KOOS JR (4 studies), and KSS (2 studies). Psychological outcome measures included HADS-A and HADS-D (2 studies), ISR Score (2 studies), PHQ-4 (1 study),

and PA-F-KF (1 study). Quality of life measures included SF-36 (17 studies), SF-12 (5 studies), EQ-5D (5 studies), FLZ (2 studies), PROMIS (3 studies), DT modified (1 study), and WHOQOL-BREF (1 study).

Since there are currently no standardized physical and psychological outcome measures specific for the management of patients with orthopedic infections, we must rely on the metrics used in orthopedics in general. Each specialty within orthopedics uses its own outcome measures. In Total Joint Arthroplasty (TJA), the recommendation from the American Association of Hip and Knee Surgeons is to use either the PROMIS 10 or VR-12 instruments to assess general health and the KOOS JR or HOOS JR to assess joint specific health[1]. The Orthopedic Trauma Association does not currently recommend specific outcome measures within the subspecialty. However, the most prevalent general measures reported are the VAS, EQ-5D, SF-36, and SF-12 with use of specialized outcomes of Disability of Arm Shoulder and Hand Score (DASH), Oswestry Disability Index (ODI), and HHS for traumatic orthopaedic injuries specific to the upper extremity, lower back, and hip, respectively [2]. Spine surgery as a specialty also does not have a standard recommendation or consensus for outcome measures. The Neck Disability Index (NDI) [3], ODI [3-5], Modified Japanese Orthopaedic Association (mJOA) [3, 4], and Rolland-Morris Disability Questionnaire [3, 5] are the most common disease-specific tools involving pathology of the spine. General outcome measures within the specialty are reported most frequently using the SF-36 [5], VAS [4], and EQ-5D [5] with the VAS measurement appearing at an increasing rate in the literature compared to the others. In general, orthopaedic spine and trauma surgery use a combination of disease-specific outcome measures while utilizing general measures, as well. The VAS, EQ-5D, and SF-36 appear to have the most generalizability to assess the physical function and quality of life measures for patients undergoing either orthopaedic trauma or spine surgery.

Author	Year	Outcome Measure			Design	Population
		Physical	Psychological	Quality of Life		
Ghanem [6]	2007	WOMAC	-	SF-36	Prospective	PJI
Boettner [7]	2011	HHS	-	RAND-36 (Same as SF-36)	Retrospective	PJI (2-Stage)
Petilon [8]	2012	ODI, NRS	-	SF-36	Case Control	Spine
Kim [9]	2012	UCLA Activity Scale, KSS Pain & Function	-	-	Retrospective	PJI (2-Stage)
Chen [10]	2012	-	-	SF-12	Retrospective	PJI (fusion, amputation)
Aboltins [11]	2013	HHS	-	SF-12	Case Control	PJI (DAIR)
Nunez [12]	2015	WOMAC	-	SF-36	Prospective	PJI
Helito [13]	2015	Ability to walk	-	SF-36	Case Series	PJI (amputation)
Rohner [14]	2015	VAS, KOOS	-	SF-36	Retrospective	PJI (fusion)
Lee [15]	2016	VAS	HADS-A, HADS-D	SF-36	Retrospective	PJI (2-Stage)
Aboltins [16]	2016		-	SF-12	Retrospective	PJI (DAIR)
Beaupre [17]	2017	WOMAC	-	RAND-36 (Same as SF-36)	Prospective	PJI (2-Stage)
Grammatopoulos [18]	2017	OHS	-	-	Case Control	PJI
Gelhorn [19]	2018	PROMIS- PF	-	-	Qualitative	PJI & Spine
Poulsen [20]	2018	OHS	-	EQ-5D	Cross Sectional	PJI (2-Stage)
Vincenten [21]	2019	-	-	WHOQOL-BREF, EQ-5D-3L	Cross Sectional	PJI (Girdlestone)
Knebel [22]	2020	-	PHQ-4, PAF-F-KF	SF-12, FLZ Herschbach & Henrich Score	Prospective	PJI (2-Stage)
Golgelioglu [23]	2020	KSS	-	SF-36	Retrospective	PJI (2-Stage)
Walter [24]	2021	-	ISR Score	SF-36, EQ-5D	Retrospective	PJI
Wildeman [25]	2021	OHS	-	EQ-5D-5L	Retrospective	PJI
Goh [26]	2021	KSS, OKS	-	SF-36	Retrospective	PJI
Lueck [27]	2022	-	HADS	SF-36, FLZ	Prospective	PJI (2-Stage)
Karamian [28]	2022	ODI, VAS Back & Leg	-	SF-12	Case Control	Spine

Walter [29]	2022	-	-	SF-36, EQ-5D, Expectation Questionnaire	Case Series	PJI and FRI (fusion)
Bohle [30]	2022	VAS, Modified Lysholm, WOMAC	-	SF-36	Retrospective	PJI (amputation)
Wixted [31]	2023	PEQ	-	PROMIS	Retrospective	PJI (Girdlestone)
Shichman [32]	2023	-	-	PROMIS (Modified Version)	Retrospective	PJI
Abboud [33]	2023	ODI, SF-WAI	-	SF-36, SF-MPQ	Retrospective	Spine
Conway [34]	2023	KOOS	-	SF-36	Retrospective	PJI (fusion)
Lastinger [35]	2023	HOOS JR, KOOS JR	-	Adapted DT	Retrospective	PJI
Gitajn [36]	2024	BPI	-	VR-12	Retrospective	FRI
VanEngen [37]	2024	KOOS JR	-	PROMIS-10	Retrospective	PJI (DAIR)
Walter [38]	2024	-	ISR Score	SF-36, EQ-5D	Prospective	PJI
Manning [39]	2024	OHS, OKS	-	-	Prospective	PJI

Physical Outcome Measures

BPI: Brief Pain Inventory

HHS: Harris Hip Score

HOOS JR: Hip Disability and Osteoarthritis Outcome Score, Joint Replacement

KOOS JR: Knee Disability and Osteoarthritis Outcome Score, Joint Replacement

KSS: Knee Society Score

Modified Lysholm

NRS: Numerical Pain Rating Scale

ODI: Oswestry Disability Index

OHS: Oxford Hip Score

OKS: Oxford Knee Score

PEQ: Prosthesis Evaluation Questionnaire

PROMIS-PF: Patient Reported Outcome Measure Physical Function

UCLA Activity Scale

VAS: Visual Analogue Score

WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index

Psychological Outcome Measures

HADS: Hospital Anxiety and Depression Scale

ISR: ICD-10 Symptom Rating

PA-F-KF: Fear of Progression Score

PHQ-4: Patient Health Questionnaire 4

Quality of Life Outcome Measures

DT adapted: Distress Thermometer adapted

EQ-5D: EuroQol-5D

FLZ: Questionnaire on life satisfaction

PROMIS: Patient Reported Outcomes Measurement Information System Global-10 Short Form

SF-36: Short Form 36

SF-12: Short Form 12

WHOQOL-BREF: World Health Organization Quality of Life- BREF

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