

	Fried	Aklog	Berger	Burchiel	Burke	Christenson	Fendrick	McDonough	Ommaya	Shatin	Kuebler	Bergthold	Kirkpatrick	Sullivan	Koval	Boyan	Voting Member Average	Overall Average	
1	How well does the current scientific evidence support well-defined indications for the use of these technologies in the treatment of nonunion fractures? <i>* 1 - Poorly * 2 * 3 - Reasonably Well * 4 * 5 - Very Well</i>																		
	Ultrasound w/o surgery	2	3	2	2	2	2	2	3	3	3	3	3	3	2	2	2	2.44	2.44
	Ultrasound w/surgery	3	2	2	2	2	2	2	2	3	3	3	2	2	2	2	4	2.38	2.38
	Internal Electrical Stimulation	2	1	1	2	1	2	2	3	2	1	1	2	2	2	4	3	1.94	1.94
	EC w/o surgery	2	2	2	2	2	2	2	4	3	2	3	2	2	2	4	5	2.56	2.56
	EC w/surgery	3	2	2	2	2	2	2	2	3	2	3	2	2	2	3	4	2.38	2.38
	PEMF w/surgery	2	3	2	3	2	3	2	3	3	3	3	3	2	2	3	5	2.75	2.75
	PEMF w/o surgery	3	3	2	3	2	2	3	4	3	3	3	2	3	3	5	5	3.06	3.06
	DBM	2	2	1	1	1	2	2	1	1	2	2	2	2	2	2	4	1.50	1.81
	BMP7:	4	5	2	3	3	3	4	4	3	3	2	4	3	3	5	3	3.38	3.38
BMP2:	2	3	1	1	1	1	1	1	1	2	3	2	4	1	2	4	2.00	1.00	
2	2. How confident are you in the validity of the scientific evidence for biophysical enhancement in nonunion treatments on the following outcomes? <i>1 (no confidence) - 2 - 3 (Moderate confidence) - 4 - 5 (High confidence)</i>																		
	Ultrasound w/surgery																		
	Morbidity (infection, amputation, permanent loss of limb function)	5	2	1	1	1	5	4	5	4	3	2	4	3	3	3	3	3.06	3.06
	Radiographic Healing	3	2	2	2	2	2	2	2	2	2	3	3	4	2	2	4	2.10	2.44
	Clinical Healing	2	2	2	2	2	2	1	2	2	3	3	2	4	2	2	3	2.25	2.25
	Radiographic Healing and Clinical Healing	3	2	2	2	2	2	2	2	2	1	3	2	4	2	2	3	2.00	2.25
	Ultrasound w/o surgery																		
	Morbidity (infection, amputation, permanent loss of limb function)	3	3	4	1	4	5	5	5	5	3	5	4	4	3	4	3	3.81	3.81
	Radiographic Healing	3	3	2	2	2	2	2	3	2	1	4	4	4	2	2	3	2.20	2.56
	Clinical Healing	2	3	2	2	2	2	1	3	2	1	4	3	4	2	2	2	2.31	2.31
	Radiographic Healing and Clinical Healing	3	3	2	2	2	2	2	3	2	1	4	3	4	2	2	3	2.20	2.50
	Internal electrical																		
	Morbidity (infection, amputation, permanent loss of limb function)	3	1	1	1	1	3	3	3	2	3	2	2	3	1	4	2	2.19	2.19
	Radiographic Healing	2	2	2	2	2	3	2	3	2	1	1	2	2	2	4	3	2.10	2.19
	Clinical Healing	2	2	2	2	2	3	2	3	2	1	2	2	2	2	4	3	2.25	2.25
	Radiographic Healing and Clinical Healing	2	2	2	2	2	2	2	3	2	1	2	2	2	2	4	3	2.00	2.19
	EC w/o surgery																		
	Morbidity (infection, amputation, permanent loss of limb function)	4	3	1	1	2	5	4	5	4	3	3	4	3	2	5	5	3.38	3.38
	Radiographic Healing	3	2	2	3	2	2	2	4	2	3	2	3	2	2	4	5	2.50	2.69
	Clinical Healing	3	2	2	3	2	2	2	4	2	3	2	2	2	2	4	5	2.63	2.63
Radiographic Healing and Clinical Healing	3	2	2	3	2	2	2	4	2	2	2	2	2	2	4	5	2.40	2.56	
EC w/surgery																			
Morbidity (infection, amputation, permanent loss of limb function)	4	2	1	1	2	5	3	5	4	3	3	4	3	2	5	5	3.25	3.25	

	Radiographic Healing	3	3	2	2	2	2	4	2	2	2	2	3	2	2	4	5	2.40	2.63
	Clinical Healing	3	3	2	2	2	2	2	2	2	2	2	2	2	2	4	5	2.44	2.44
	Radiographic Healing and Clinical Healing	3	3	2	2	2	2	2	2	2	1	2	2	2	2	4	5	2.10	2.38
	PEMF w/surgery																		
	Morbidity (infection, amputation, permanent loss of limb function)	5	2	1	1	2	3	4	5	4	3	4	3	4	3	5	5	3.38	3.38
	Radiographic Healing	4	3	2	3	2	3	3	3	3	4	3	4	4	2	4	5	3.00	3.25
	Clinical Healing	3	3	2	3	2	3	2	3	3	2	3	3	4	3	4	5	3.00	3.00
	Radiographic Healing and Clinical Healing	4	3	2	3	2	3	2	3	3	2	3	3	4	3	4	5	2.70	3.06
	PEMF w/o surgery																		
	Morbidity (infection, amputation, permanent loss of limb function)	5	4	1	1	2	5	4	5	5	3	5	5	4	4	5	5	3.94	3.94
	Radiographic Healing	4	4	2	3	3	3	3	4	3	2	5	4	3	2	4	4	3.10	3.31
	Clinical Healing	3	4	2	3	3	3	2	4	3	1	4	3	4	3	4	5	3.19	3.19
	Radiographic Healing and Clinical Healing	4	4	2	3	3	3	2	4	3	1	4	3	4	3	4	5	2.90	3.25
	DBM:																		
	Morbidity (infection, amputation, permanent loss of limb function)	3	1	1	1	1	2	2	3	1	3	3	1	2	1	2	4	1.94	1.94
	Radiographic Healing	2	2	2	2	2	2	3	1	2	2	3	2	1	2	2	4	2.00	2.13
	Clinical Healing	2	2	2	2	2	2	2	1	2	1	3	2	2	2	2	4	2.06	2.06
	Radiographic Healing and Clinical Healing	2	2	2	2	2	2	2	1	2	1	3	2	2	2	2	4	1.80	2.06
	BMP7:																		
	Morbidity (infection, amputation, permanent loss of limb function)	4	5	2	1	2	3	4	3	2	2	3	4	3	4	5	4	3.19	3.19
	Radiographic Healing	4	4	3	3	3	3	3	4	3	3	2	3	4	3	5	3	3.30	3.31
	Clinical Healing	4	4	3	3	3	3	2	4	3	3	3	3	4	4	5	4	3.44	3.44
	Radiographic Healing and Clinical Healing	4	4	3	3	3	3	2	4	3	2	3	3	4	4	5	4	3.10	3.38
	BMP2:																		
	Morbidity (infection, amputation, permanent loss of limb function)	2	3	1	1	1	2	3	3	1	2	3	3	3	1	2	4	2.19	2.19
	Radiographic Healing	2	3	2	2	2	2	2	1	1	3	2	1	3	1	2	4	2.00	2.06
	Clinical Healing	2	3	2	2	2	2	2	1	1	3	2	2	3	1	2	4	2.13	2.13
	Radiographic Healing and Clinical Healing	2	3	2	2	2	2	2	1	1	2	2	2	3	1	2	4	2.00	2.06
3	How likely is it that the following treatments for nonunion fractures will positively affect the following health outcomes, where the outcome is causally related to the respective biophysical enhancement? <i>1(not likely) - 2 - 3(reasonably likely) - 4 - 5 (very likely)</i>																		
	Ultrasound w/surgery																		
	Morbidity (infection, amputation, permanent loss of limb function)	5	4	2	1	2	5	5	5	5	2	5	5	3	2	1	5	3.56	3.56
	Radiographic Healing	4	3	2	2	2	2	4	2	3	4	4	3	4	2	2	4	2.80	2.94
	Clinical Healing	4	3	2	2	2	2	3	2	2	3	3	3	4	2	2	4	2.69	2.69
	Radiographic Healing and Clinical Healing	4	3	2	2	2	2	3	2	2	1	3	3	4	2	2	4	2.30	2.56
	Ultrasound w/o surgery																		
	Morbidity (infection, amputation, permanent loss of limb function)	5	5	2	1	2	5	5	5	5		4	5	3	3	4	4	3.87	3.87
	Radiographic Healing	4	4	2	2	2	3	4	3	3		4	4	4	3	2	3	3.00	3.13
	Clinical Healing	4	4	2	2	2	3	3	3	2		4	3	4	3	2	3	2.93	2.93

Radiographic Healing and Clinical Healing	4	2	4	2	2	3	3	3	2		4	3	4	3	2	3	2.78	2.93
Internal electrical																		
Morbidity (infection, amputation, permanent loss of limb function)	4	4	2	2	1	2	4	3	3	2	3	1	2	2	3	4	3.00	2.63
Radiographic Healing	3	2	2	2	2	2	2	3	2	2	1	2	2	2	4	4	2.20	2.31
Clinical Healing	3	2	2	2	2	2	2	3	2	2	1	3	3	2	4	4	2.44	2.44
Radiographic Healing and Clinical Healing	3	2	2	2	2	2	2	3	2	1	1	3	3	2	4	4	2.10	2.38
EC w/o surgery																		
Morbidity (infection, amputation, permanent loss of limb function)	5	3	2	1	2	4	4	5	5	2	4	4	2	2	4	4	3.31	3.31
Radiographic Healing	4	3	2	2	2	3	3	4	3	2	4	3	2	2	4	5	2.80	3.00
Clinical Healing	3	3	2	2	2	3	3	4	3	2	4	3	2	2	4	5	2.94	2.94
Radiographic Healing and Clinical Healing	3	3	2	2	2	3	3	4	3	1	4	3	2	2	4	5	2.60	2.88
EC w/surgery																		
Morbidity (infection, amputation, permanent loss of limb function)	4	2	2	1	2	4	4	5	5	3	3	3	3	3	4	4	3.25	3.25
Radiographic Healing	4	3	2	3	2	2	3	2	3	4	3	4	3	3	4	4	3.06	3.06
Clinical Healing	4	3	2	3	2	2	2	2	2	3	2	4	3	3	4	4	2.81	2.81
Radiographic Healing and Clinical Healing	4	3	2	3	2	2	2	2	2	2	3	4	3	3	4	4	2.81	2.81
PEMF w/surgery																		
Morbidity (infection, amputation, permanent loss of limb function)	5	2	2	1	2	4	5	5	4	3	4	4	3	4	5	4	3.56	3.56
Radiographic Healing	4	3	2	3	2	3	3	4	3	4	4	3	4	2	4	5	3.10	3.31
Clinical Healing	4	3	2	3	2	3	2	3	3	3	4	3	4	3	4	5	3.19	3.19
Radiographic Healing and Clinical Healing	4	3	2	3	2	3	2	3	3	2	4	3	4	3	4	5	2.70	3.13
PEMF w/o surgery																		
Morbidity (infection, amputation, permanent loss of limb function)	4	5	2	3	2	5	5	5	5		5	4	2	2	1	2	4.00	3.00
Radiographic Healing	4	4	2	3	2	3	4	4	3		4	4	4	3	5	5	3.22	3.60
Clinical Healing	4	4	2	3	2	3	3	4	3		4	4	5	3	5	5	3.60	3.60
Radiographic Healing and Clinical Healing	4	4	2	3	2	3	3	4	3		4	4	5	3	5	5	3.11	3.60
DBM:																		
Morbidity (infection, amputation, permanent loss of limb function)	4	4	3	3	3	3	2	4	3		3	3	4	4	5	4	3.22	3.47
Radiographic Healing	3	2	2	2	2	2	3	1	2		3	2	2	2	2	4	2.27	2.27
Clinical Healing	3	2	2	2	2	2	3	1	2		3	2	3	2	2	4	2.00	2.00
Radiographic Healing and Clinical Healing	3	2	2	2	2	2	3	1	2		3	2	3	2	2	4	2.18	2.33
BMP7:																		
Morbidity (infection, amputation, permanent loss of limb function)	5	5	3	1	3	3	4	3	2	2	3	3	3	4	5	4	3.31	3.31
Radiographic Healing	4	4	3	3	3	3	4	4	3	3	3	3	4	4	5	3	3.50	3.50
Clinical Healing	4	4	3	3	3	3	3	4	3	3	3	3	4	4	5	3	3.44	3.44
Radiographic Healing and Clinical Healing	4	4	3	3	3	3	3	4	3	2	3	3	4	4	5	4	3.44	3.44
BMP2:																		
Morbidity (infection, amputation, permanent loss of limb function)	3	4	2	1	2	3	3	3	2	2	3	3	4	1	3	5	2.75	2.75
Radiographic Healing	3	3	2	2	2	2	1	1	1	3	3	3	5	2	3	5	2.56	2.56
Clinical Healing	3	3	2	2	2	2	2	1	1	3	3	2	5	3			2.43	2.43

	Radiographic Healing and Clinical Healing	3	3	2	2	2	2	2	1	1	2	3	2	5	2	3	5	2.50	2.50
4	How confident are you that the following technologies will produce a clinically important net health benefit for patients with a nonunion fracture?																		
	<i>1(no confidence) - 2 - 3(Moderate confidence) - 4 - 5 (High confidence)</i>																		
	Ultrasound w/o surgery	3	3	2	2	2	2	3	2	2	3	5	4	3	3	2	4	2.81	2.81
	Ultrasound w/surgery	4	4	2	2	3	3	4	3	2	2	4	3	4	2	3	4	3.06	3.06
	Internal Electrical Stimulation	3	2	1	2	2	2	2	3	2	2	2	2	3	2	4	4	2.38	2.38
	EC w/o surgery	3	3	2	2	2	3	3	2	2	3	3	2	2	2	3	4	2.56	2.56
	EC w/surgery	3	3	2	2	2	4	3	4	3	2	2	3	3	2	4	4	2.88	2.88
	PEMF w/surgery	3	3	2	2	2	3	3	3	3	3	3	3	3	3	4	5	3.00	3.00
	PEMF w/o surgery	4	4	2	2	2	4	4	4	3	3	3	3	4	3	5	5	3.44	3.44
	DBM	2	2	1	2	2	3	3	1	1		3	3	3	2	3	4	2.33	2.33
	BMP7:	4	5	2	3	3	4	4	4	3		3	4	5	4	5	4	3.80	3.80
	BMP2:	3	3	1	2	2	4	3	1	1		3	2	5	1	3	5	2.60	2.60
	6. How confident are you that the improved net health outcomes will hold for the off-label treatments of nonunion fractures using orthobiologic devices?																		
	<i>1(No Confidence) - 2 - 3(Moderate Confidence) - 4 - 5 (High Confidence)</i>	3	3	2	2	2	2	2	2	1	1	1	2	1	1	1	4	1.85	1.88
	7. How likely is it that completely healed nonunion fractures resulting from these treatments can be generalized to :																		
	<i>1(Not Likely) - 2 - 3(Reasonably Likely) - 5 (Very Likely)</i>																		
	a. Fracture types for which there are no clinical studies:	3	4	3	3	2	3	2	3	3	3	3	3	3	3	4	4	3.06	3.06
	b. Providers (facilities/physicians) practice:	4	5	3	3	3	2	2	3	3	3	3	2	3	2	4	3	3.00	3.00
	c. Medicare population	4	4	3	3	3	2	2	3	3	4	3	3	4	4			3.21	3.21
	8. How confident are you that orthobiologics are equivalent in the treatment of nonunion fractures?																		
	<i>1(No Confidence) - 2 - 3(Moderate Confidence) - 4 - 5 (High Confidence)</i>	1	1	1	2	1	2		1	1	2	3	1	1	1	1	2	1.33	1.40
	8. How confident are you that Bone Morphogenic Protein 2 and Bone Morphogenic Protein 7 are equivalent in the treatment of nonunion fractures?																		
	<i>1(No Confidence) - 2 - 3(Moderate Confidence) - 4 - 5 (High Confidence)</i>	2	3	2	3	3	3		2	2		2	2	4	2	4	2	2.50	2.57