

TABLE E-1 Summary of Level of Evidence and Funding

Level of Evidence	Number of Studies	Number of Studies That Were Funded	Number of Studies That Were Not Funded
Therapy			
I	14	6	8
II	4	2	2
III	8	2	6
IV	29	4	25
V	2	1	1
Prognosis			
I	2	1	1
II	8	0	8
III	0	0	0
IV	2	1	1
V	0	0	0
Diagnosis			
I	1	1	0
II	2	0	2
III	0	0	0
IV	1	0	1
V	0	0	0
Economic Analysis			
I	0	0	0
II	1	1	0
III	0	0	0
IV	0	0	0
V	0	0	0

TABLE E-2 Current Evidence in Orthopaedic Trauma

Reference	Level of Evidence	Sample Size	Summary	Funding Status
Therapy*				
Anglen	I	400	Irrigation of open fracture wounds with antibiotic solutions offers no advantage over the use of nonsterile soap solution, and it may increase the risk of wound healing problems.	Not funded
Bhandari et al.	I	155	Plate fixation of humeral shaft fractures may reduce the risk of reoperation and shoulder impingement.	Not funded
Blomfeldt et al.	I	102	Compared with internal fixation, primary total hip replacement provides a better outcome for mentally competent elderly patients with a displaced femoral fracture.	Funded by both industry and government grants (Trygg-Hansa Insurance Company, the Swedish Society for Medical Research, the Swedish Orthopaedic Association, and the Stockholm County Council)
Fuchs et al.	I	227	The incidence of deep-vein thrombosis was 25% in the LMWH group compared with 3.6% in those who had additional treatment with Arthroflow device.	Not funded
Im and Tae	I	64	Intramedullary nails are recommended for fractures associated with soft-tissue damage of Tscherne C2 or higher.	Not funded
Jackson et al.	I	36,282	Among healthy postmenopausal women, calcium with vitamin-D supplementation resulted in a small but significant improvement in hip bone density, did not significantly reduce hip fracture, and increased the risk of kidney stones.	Funded by a government grant (National Heart, Lung, and Blood Institute)
Kim et al.	I	58	A proximal femoral nail provides superior clinical outcomes but provides no advantage with regard to functional outcome when compared with a long-stem cementless calcar-replacement arthroplasty.	Not funded
Ly and Coetzee	I	41	A primary stable arthrodesis of the medial two or three rays appears to have a better short and intermediate-term outcome than open reduction and internal fixation of ligamentous Lisfranc joint injuries.	Not funded
Mattsson et al.	I	112	Augmentation with calcium phosphate cement in unstable trochanteric fractures provides a modest reduction in pain and a slight improvement in quality of life.	Funded by an industry grant (Trygg-Hansa)
Parker et al.	I	5135	On the basis of early reports of randomized trials, hip protectors were advocated.	Not funded
Parker and Handoll	I	3646	Given the lower complication rate of the sliding hip screw in comparison with intramedullary nails, sliding hip screws appear to be superior for trochanteric fractures.	Not funded
Starr et al.	I	34	Both devices (Russell-Taylor Recon Nail and Howmedica Long Gamma Nail) yielded predictably good results in these difficult fractures.	Funded by a foundation grant (The Suzanne and Aaron A. Hoffman, MD, Orthopaedic Research Fund)
Kreder et al.	I	113	There were no definitive conclusions regarding the superiority of closed reduction and casting only as compared with external fixation with or without Kirschner wires for the treatment of distal radial fractures with a congruous joint.	Funded by a foundation grant (Orthopaedic Research and Education Foundation)
Kreder et al.	I	179	Patients who underwent indirect reduction and percutaneous fixation had a more rapid return of function and a better functional outcome than those who underwent open reduction and internal fixation, provided that the intra-articular step and gap deformity were minimized.	Funded by a foundation grant (Orthopaedic Research and Education Foundation, the Orthopaedic Trauma Association, and Sunnybrook Trust Fund)
Boldin et al.	II	26	The Less Invasive Stabilization System provided stable fixation of extra-articular and intra-articular proximal tibial fractures and good functional outcomes with a low complication rate.	Not funded
Ikeda et al.	II	28	These results support a recommendation for open reduction and internal fixation for the treatment of a comminuted radial head fracture.	Not funded
MacKenzie et al.	II	397	The results confirm previous conclusions that reconstruction for the treatment of injuries distal to the distal part of the femur typically results in functional outcomes equivalent to those of amputation.	Funded by a government grant (National Institutes of Health, National Institute for Arthritis and Musculoskeletal and Skin Diseases)
Ricci et al.	II	61	Nailing through the greater trochanter with the patient supine is presently the authors' treatment of choice for patients with femoral shaft fractures.	Funded by an industry grant (Smith and Nephew)

Bosse et al.	III	55	Outcome was not adversely affected by limb salvage, despite the presence of an insensate foot at the time of presentation. More than one-half of the patients who had presented with an insensate foot that was treated with limb reconstruction ultimately regained sensation at two years.	Funded by a government grant (National Institutes of Health, National Institute for Arthritis and Musculoskeletal and Skin Diseases)
Coles et al.	III	67	The olecranon osteotomy can be useful for the visualization of the complex articular injuries, allowing accurate articular reduction.	Not funded
Egol et al.	III	72	The authors recommend fibular plating whenever intramedullary nailing is contemplated for an unstable distal tibial-fibular fracture.	Not funded
Ha et al.	III	51	Percutaneous vertebroplasty is an effective treatment for osteoporotic compression fractures with or without an intravertebral cleft.	Not funded
Li et al.	III	120	Posterior body reconstruction with a transpedicle body augmentor can maintain kyphosis correction and vertebral restoration, prevent implant failure, and lead to better clinical results.	Funded by a foundation grant (Huan-Hsian Spine Research Foundation)
Simanski et al.	III	66	There were no disadvantages with early weight-bearing compared with six weeks without weight-bearing concerning hospital stay, pain intensity, time until return to work, and Olerud/Tegner scores.	Not funded
Zelle et al.	III	1125	Overall point estimates suggest that nonunion, malunion, and infection rates are similar for patients undergoing intramedullary nailing and plating.	Not funded
Zlowodzki et al.	III	2144	Future studies need to compare different fixation techniques for clavicular fractures in a prospective, randomized manner. Studies should be based on an adequate sample size to allow meaningful interpretation of the results.	Not funded
Bhattacharyya et al.	IV	14	Tibial plateau fractures can be successfully treated with a posterior approach with direct reduction and buttress fixation of articular fragments.	Not funded
Bhattacharyya et al.	IV	19	The authors do not recommend the posterolateral approach for the routine treatment of tibial pilon fractures.	Not funded
Bellabarba et al.	IV	14	Treatment of type-B lateral compression injuries of the pelvic ring with anterior distraction external fixation is a highly effective yet relatively simple and minimally invasive treatment method.	Not funded
Bransford et al.	IV	245	This study supports the safety of pedicle screws in the thoracic spine when using preoperative imaging evaluation, standard posterior element landmarks, and intraoperative fluoroscopy.	Not funded
Egol et al.	IV	53	This study supports the practice of delayed internal fixation until the soft-tissue envelope allows for definitive fixation.	Not funded
Gosling et al.	IV	68	The reduction technique for exact alignment is demanding.	Not funded
Griffin et al.	IV	62	Percutaneous iliosacral screw fixation is a useful technique for the treatment of vertically unstable pelvic fractures, but a vertical sacral fracture should make the surgeon more wary of fixation failure and loss of reduction.	Not funded
Griffin et al.	IV	106	The extended iliofemoral approach can be performed safely in selected complex acetabular fractures with an acceptable clinical outcome and rate of complications.	Not funded
Hanel et al.	IV	62	The bridge plating technique can be performed easily and achieves the goals of maintenance of fracture reduction, allows weight-bearing through the injured extremity, and is associated with few complications.	Not funded
Harwood et al.	IV	173	Infection rates after damage-control orthopaedics for femoral fractures are comparable with those after primary intramedullary nailing.	Not funded
Herscovici et al.	IV	42	Open reduction appears to be an acceptable method of treatment for displaced calcaneal fractures in elderly patients.	Not funded
Koukakis et al.	IV	20	The PHILOS plate is suitable for the majority of fractures provided that the correct surgical treatment is used.	Not funded
Koval et al.	IV	33,704	The authors found a large variation through the United States in both the rate of ankle fractures and the percentage of fractures that undergo surgical intervention.	Not funded
Lindahl et al.	IV	1049	The difficulty in separating type-B1 from type-B2 fractures suggests that the prosthesis should be considered as loose until proven otherwise.	Not funded

Martin et al.	IV	62	This procedure provides satisfactory early functional results, simplifies rehabilitation by limiting postoperative motion to a lesser degree than other techniques, is less aggressive than open reduction techniques and ostosynthesis, and leads to few complications.	Not funded
Matta	IV	373	The ilioinguinal surgical approach was found to be effective for the treatment of 119 (about 33%) of the 373 acetabular fractures treated by the author over a ten-year period.	Funded by a foundation grant (AO/ASIF Foundation)
McHenry et al.	IV	1032	Early operative stabilization of thoracic and lumbar fractures, the only risk factor that can be controlled by the physician, may decrease the risk of respiratory failure in multiply injured patients.	Funded by a government grant (National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institutes of Health)
Nork et al.	IV	36	Intramedullary nailing is an effective alternative for the treatment of distal metaphyseal tibial fractures.	Not funded
Nowak et al.	IV	222	The risk of persistent symptoms following nonoperative treatment of clavicular fractures was far higher than expected.	Not funded
O'Toole et al.	IV	24	The Less Invasive Stabilization System may be an appropriate treatment alternative for femoral fractures associated with stable hip or knee prostheses.	Unknown
Prather et al.	IV	50	Vertebroplasty is an effective treatment for patients with intractable pain due to osteoporotic vertebral compression fractures.	Not funded
Ricci et al.	IV	50	The results of this study support the use of indirect open reduction and internal fixation with a single extraperiosteal lateral plate, without the use of allograft struts, for the treatment of a femoral shaft fracture about a stable intramedullary implant.	Not funded
Ricci et al.	IV	22	Fixation of periprosthetic supracondylar femoral fractures with a locking plate provided satisfactory results in nondiabetic patients.	Not funded
Ring et al.	IV	25	Combined dorsal and volar plate fixation of the distal part of the radius can achieve a stable, mobile wrist in patients with very complex fractures.	Funded by a foundation grant (AO Foundation)
Russell et al.	IV	68	Mini-fragment plates are easier to contour and are less prominent.	Not funded
Schildhauer et al.	IV	19	Triangular osteosynthesis is a demanding procedure that can be performed on vertically unstable sacral fractures to allow early progressive weight-bearing with an acceptable complication rate.	Not funded
Schmidt et al.	IV	28	The study provided evidence of a high rate of associated ipsilateral knee injuries in patients with a traumatic hip dislocation.	Funded by a foundation grant (The Pittsburgh Foundation)
Sheerin et al.	IV	15	The staged treatment of high-energy distal tibial fractures with soft-tissue injury can lead to good outcomes and consistent bone union.	Not funded
Siebenrock et al.	IV	10	Trochanteric flip osteotomy in combination with Kocher-Langenbeck approach allows for better visualization, more accurate reduction, and easier fixation of cranial acetabular fragments.	Not funded
Bhandari et al.	V	298 surveys	While surgeons prefer internal fixation for younger patients and arthroplasty for older patients, they disagree about the optimal approach to the management of patients between sixty and eighty years of age with a displaced fracture and active patients with a Garden type-III fracture.	Not funded
Skedros et al.	V	107 surveys	Although the majority of orthopaedic surgeons believe that they should expand their role in the medical treatment of patients with an osteoporotic fracture, many do not institute medical treatment and think that the patient's primary care providers should be responsible for medical care.	Funded by an industry grant (Merck and Company and from the Utah Bone and Joint Center, Salt Lake City, Utah)
Prognosis†				
Egol et al.	I	232	Younger age, male gender, absence of diabetes, and a lower ASA class are predictive of functional recovery at one year following ankle fracture surgery.	Not funded
Hung et al.	I	84	Low bone-mineral density is an important risk factor for low-energy Colles fractures.	Funded by a government grant (Hong Kong Health Services Research Committee)
Audige et al.	II	416	The authors encouraged the use of PATH analysis in orthopaedics as a powerful visual technique to interpret data from observational study.	Not funded
Bottomley et al.	II	54	The authors found that sixteen of the eighteen patients with biceps avulsion or avulsion fracture of the fibular head had a displaced common peroneal nerve.	Not funded

Dubberley et al.	II	28	Patients with isolated noncomminuted capitellar and/or trochlear fractures may have better results than those with more complex fractures.	Not funded
Frenisy et al.	II	50	Even though patients with multiple trauma do not receive a psychologic assessment of their cerebral functioning and do not benefit from any rehabilitation, they exhibit neurobehavioral and psychopathological disorders, which need to be taken into account when designing rehabilitation programs.	Not funded
Karunakar et al.	II	169	Body-mass index is predictive of complications after operative treatment of acetabular fractures.	Not funded
Smith et al.	II	230	Unstable pelvic fractures in children can result in long-term morbidity and functional problems.	Not funded
Weening et al.	II	2,538	An observational study of multiply injured trauma patients who had been involved in motor-vehicle accidents indicated that scapular fractures occur 3.7% of the time, that the presence of a scapular fracture was associated with a lower mortality, and that scapular fractures should alert health-care personnel to the presence of other injuries.	Not funded
Zlowodzki et al.	II	80	Increased age, a displaced fracture, and poor reduction increase the risk of fixation failure.	Not funded
Boileau et al.	IV	203	Total shoulder arthroplasty yielded better results than hemiarthroplasty did.	Funded by an industry grant (Tornier)
McKee et al.	IV	30	The authors detected residual deficits in shoulder strength and endurance in this patient population, which may be related to the significant level of dysfunction detected by the patient-based outcome measures.	Not funded
Diagnosis‡				
Bogoch et al.	I	422	In a coordinated post-fracture osteoporosis education and treatment program directed at patients with a fragility fracture and their caregivers, >95% of patients were appropriately diagnosed, treated, or referred for osteoporosis care.	Funded by an industry grant (Merck Frosst Canada and Company)
Gardner et al.	II	59	The Lauge-Hansen classification system may have some limitations as a predictor of the mechanism of injury and the presence of soft-tissue damage associated with ankle fractures.	Not funded
Haraguchi et al.	II	57	Because of the great variation in fracture configurations, preoperative use of computed tomography may be justified.	Not funded
Mullis and Dahners	IV	36	Loose bodies are routinely present after closed treatment of hip dislocations or wall fractures not otherwise requiring surgery, even when radiographs are negative.	Not funded
Economic analysis§				
Brauer et al.	II	NR	Operative treatment of displaced intra-articular fractures is economically attractive.	Funded by a foundation grant (Alberta Heritage Foundation for Medical Research)

*Investigating the results of a treatment. †Investigating effect of patient characteristic on the outcome of a disease. ‡Investigating a diagnostic test.

§NR = not reported.

TABLE E-3 Summary of Granting Agencies*

Alberta Heritage Foundation for Medical Research
AO/ASIF Foundation
AO Foundation
Dr Foster Ltd (an independent health service research organization)
Hong Kong Health Services Research Committee
Huan-Hsian Spine Research Foundation
Merck and Company
Merck Frosst Canada and Company
Orthopaedic Research and Education Foundation (2 publications)
Orthopaedic Trauma Association
Smith and Nephew Inc.
Sunnybrook Trust Fund
Swedish Society for Medical Research
Swedish Orthopaedic Association
Stockholm County Council
The National Heart, Lung, and Blood Institute
The National Institutes of Health, National Institute for Arthritis and Musculoskeletal and Skin Diseases (3 publications)
The Pittsburgh Foundation
The Suzanne and Aaron A. Hoffman, MD, Orthopaedic Research Fund
Tornier, Inc.
Trygg-Hansa (2 publications)
Utah Bone and Joint Center, Salt Lake City, Utah

*Please note that some studies were funded by multiple sources.