Engaging Surgeons to Define and Refine the Bone Healing Index

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Introduction

Bone healing index (BHI) is used to evaluate the rate of bone formation and consolidation in distraction osteogenesis. It is typically defined as the ratio of healing duration to the amount lengthened. Recent work by the authors identified large disparities in how BHI is reported in the literature. These discrepancies include differing start points of when healing begins, when healing ends, or what is considered healed. We sought to determine how BHI is used by practicing surgeons and their attitudes surrounding its reporting.

Materials and Methods

- A Qualtrics survey was distributed to members of the Limb Lengthening and Reconstruction Society from July 16, 2025 to November 17, 2025.
- We collected basic demographic information such as age, gender, and region of practice. We collected basic demographic information such as age, gender, and region of practice.
- Those familiar with the term BHI answered a secondary set of questions, including what they considered the start of bone healing, when bone healing was complete, and what the optimal way to define a bone as “healed” is.
- Each question included multiple choice answers with an additional fill in the blank option available when appropriate.
- There were a total of 63 responses but only 52 were mostly complete. There were only 43 responses for the secondary portion of the survey about BHI.

Results

Table 1. Demographics

Characteristic	N (%)
Sex	
Male	41 (78.8)
Female	11 (21.1)
Region (USA)	
Northeast	10 (21.7)
Southeast	9 (19.6)
Northwest	6 (13.0)
Midwest	11 (21.2)
Southwest	10 (19.2)
Mountain West	1 (1.9)
Work Setting	
Academic Hospital	41 (78.8)
Private Practice	8 (15.4)
Public or Government Hospital	7 (13.5)
Mixed Setting	6 (11.5)
Years of Practice	
0-5	14 (26.9)
6-10	15 (28.8)
11-15	13 (25.0)
16-20	2 (3.8)
20+	8 (15.4)
Fellowship*	
Trauma	23
Oncology	3
Limb lengthening and reconstruction	25
Pediatric Orthopaedics	25
Foot and Ankle	4
Spine	1

*Fifty-one participants (98.1%) of respondents completed a fellowship

Defining BHI

- 55.8% considered the start of bone healing to be the date of surgery/corticotomy (n = 24)
- 61.4% of respondents considered bone healing to be complete at consolidation/bony union (n = 27)
- 76.2% defined a bone as “healed” based on radiographic assessment (n = 32)
- 67.4% recognized BHI needs to standardized (n = 29)
- 72.1% believed defining BHI should be the responsibility of specialty societies (n = 31)

Discussion

The majority of orthopaedic surgeons specializing in limb lengthening and reconstruction who responded to this survey believe that BHI is not well defined.

Some suggestions to improve upon the consensus of BHI included publishing a definition with standardized language based on a working group. Others suggested finding the original definition and citing it and using it properly. Finally, some believed BHI is more of a “gestalt” principle, rather than a rule and overall has little clinical significance, as it is a retrospective measure.

Limitations

Response biases and sampling bias are inherent limitations with this study and survey studies in general. Participation was voluntary, so those who chose to participate may have similar qualities that prompted them to participate, which may have affected responses. While the opportunity to provide a differing response was provided, it is reasonable that the answer choices provided may have led participants to a certain answer. Surveys were also provided during conferences, so there may have been time restraints to responses, despite providing a statement to take their time with their responses. However, overall this study design is a start to understanding how healing BHI should be defined to reach a consensus.

Conclusion

Overall, there is variability in how orthopaedic surgeons define BHI. However, a majority agree that there is a need for a standardized definition . This study provides some insight as to how BHI should be standardized. By elucidating the variability in definitions, we hope to open the space to discussion amongst clinicians, authors, and journal editors to reach a consensus on how BHI should be defined to provide the infrastructure to standardize the parameter and make studies within the field comparable.