Patient Perceptions and Willingness to Pay for 3D-Printed Casts Compared to Traditional Fiberglass Casting

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Introduction

Fracture immobilization is traditionally managed with fiberglass casts, which are effective but often uncomfortable and difficult to maintain in terms of hygiene. Three-dimensional (3D) printed casts have emerged as a promising alternative, offering comparable structural integrity with potential advantages in comfort, breathability, and ease of cleaning. However, adoption is limited by uncertainty regarding patient acceptance and willingness to pay for these benefits. The objective of this study was to evaluate patient perceptions of fiberglass casts and determine willingness to pay out-of-pocket for features associated with 3D-printed casts.

Methods

A cross-sectional, institutional review board (IRB) approved survey was administered to patients (n=50) treated with fiberglass or plaster casts between February 2024 and August 2025 at a single center. Inclusion criteria included patients or their guardians if the patient was under 18 who had received elbow, wrist, leg, or other casts. Survey responses captured patient age, casted body part, insurance type, hygiene experience, immobilization effectiveness, and willingness to pay for improvements in areas such as custom fit, hygiene, and avoidance of temporary splinting. Surveys were distributed by office staff to patients meeting inclusion criteria and, to preserve anonymity, were deposited directly by patients into a secure collection box. The box was emptied bimonthly, and surveys were scanned into a digital database for manual data extraction by the research team. Descriptive statistics and chi-square tests were then performed to analyze the data.

Results

Fifty surveys were collected, with 66% of casts applied to pediatric patients (<18 years). The most common cast location was the wrist (44%). Overall, 94% of respondents rated immobilization as “extremely well” or “moderately well,” though 76% reported some degree of hygiene difficulty. Most patients (78%) indicated willingness to pay more for improved custom fit and hygiene, most commonly in the $10–150 range. A statistically significant association was observed between casts applied to “other” body parts, primarily finger casts, and the absence of hygiene issues (X^2, p=0.016). There was also a significant association between willingness to pay for improved fit and willingness to pay for improved hygiene (X^2, p<0.001), with patients unwilling to pay for hygiene improvements also reporting unwillingness to pay for improved fit. Additionally, 83% of patients who underwent temporary splinting prior to fiberglass casting expressed willingness to pay more to avoid the splinting step.

Discussion

Traditional fiberglass casts remain effective for immobilization but are associated with notable hygiene challenges. Patients expressed interest in the benefits of 3D-printed casts and willingness to pay modestly more, though current market prices ($167-$600, with some exceeding $2,000) exceed this tolerance. Insurance coverage varies depending on several factors like durable medical equipment (DME), copays/deductibles, and specific insurers. Limitations of this study include a relatively small sample size and single-site design, which may limit generalizability. However, these findings suggest that broader clinical adoption of 3D-printed casts will require on cost reduction, improved insurance coverage, and scalable production methods.

Significance/Clinical Relevance

Patients are open to 3D-printed casts and value their potential benefits, but pricing must be reduced to align with willingness to pay for these devices to become viable alternatives to fiberglass casts.

	Value	Number of Respondants	% of Respondants
Age			
	1-6 years	7	14.0%
	6-12 years	18	36.0%
	12-17 years	8	16.0%
	18-29 years	6	12.0%
	30-49 years	2	4.0%
	40-64 years	6	12.0%
	65+ years	3	6.0%
Body part of cast			
	Elbow	11	22.0%
	Leg	5	10.0%
	Wrist	22	44.0%
	Other	12	24.0%
Insurance			
	None	1	2.0%
	Medicare	4	8.0%
	Medicaid	8	16.0%
	Private	31	62.0%
	Other	6	12.0%
Imobilization Rating			
	Extremely Well	36	72.0%
	Moderately Well	11	22.0%
	Neutral	2	4.0%
	Not Very Well	1	2.0%
	Not Well At All	0	0.0%
Hygiene			
	Not at all	12	24.0%
	A little	23	46.0%
	Moderate	8	16.0%
	Large	5	10.0%
	Great Deal	2	4.0%