Systematic Review of Replant Salvage and Cost Utility Analysis of Inpatient Monitoring After Digit Replantation

Shady Elmaraghi, MD,* Jacqueline S. Israel, MD,* Brian Gander, MD*

Purpose Digit replantation is a high-stakes procedure that has been shown to be cost-effective, especially for multiple-digit replantation. However, it is associated with prolonged lengths of stay (LOS) for monitoring and attempts at salvage. The cost-effectiveness of prolonged inpatient stays presumes that this is necessary and inherent to the replantation. We hypothesized that prolonged monitoring of replanted digits, in the hope of possible salvage after primary failure, is cost-ineffective due to the low rates of vascular compromise and salvage after replantation.

Methods Using previously published data comparing quality adjusted life years lost after traumatic digit amputation versus digit replantation, we devised a cost utility model to evaluate the incremental cost-effectiveness ratio of inpatient monitoring. To determine rates of vascular compromise and salvage after digit replantation, we performed a systematic review of the literature through MEDLINE and SCOPUS database searches to identify relevant articles on digital replantation since 1990. Cost-effectiveness was stratified based on the number of digits replanted.

Results Fewer than 9% of replanted digits both experience vascular compromise and are successfully salvaged. Adjusting for this, inpatient monitoring for single-digit and thumb replantation becomes cost-ineffective after 1 day of admission and monitoring for multiple-digit replantation becomes cost-ineffective after 2 days of admission.

Conclusions In the United States, prolonged admissions for inpatient monitoring quickly become cost-ineffective, especially with relatively low rates of salvage. Surgeons should avoid extended hospitalizations for replant monitoring and should pursue enhanced recovery protocols for replantation, especially considering burgeoning health care costs in the United States. *(J Hand Surg Am. 2022;47(1):32−42. Copyright © 2022 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Economic/Decision Analysis III.

Key words Cost, cost utility, digit replantation, flap monitoring, quality adjusted life years.

SINCE THE FIRST DIGIT REPLANTATION was reported by Komatsu and Tamai in 1968,[1] this procedure has undergone multiple refinements and improved outcomes in the management of traumatic amputations. In the United States, prolonged inpatient stays are the norm after upper extremity

*From the *Division of Plastic Surgery, Department of Surgery, University of Wisconsin School of Medicine and Public Health, Madison, WI.*

Received for publication June 29, 2020; accepted in revised form July 28, 2021.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: Shady Elmaraghi, MD, Division of Plastic Surgery, Department of Surgery, University of Wisconsin School of Medicine and Public Health, G5/361 Clinical Sciences Center, 600 Highland Avenue, Madison, WI 53792; e-mail: selmaraghi@uwhealth.org.

0363-5023/22/4701-0005$36.00/0
https://doi.org/10.1016/j.jhsa.2021.07.024

TABLE 1. Inclusion and Exclusion Criteria for Systematic Review

Inclusion Criteria	Exclusion Criteria
Human subjects	Proximal amputations (proximal to metacarpophalangeal joint)
English language	Case reports
Present primary data	Technique descriptions
Report 5 or more digit replantations	Studies only examining fingertip amputations
Extractable data on vascular compromise	
Extractable data on salvage interventions and survival	
Immediate replantations	

TABLE 2. Data Extracted From Selected Articles

Total number of digits
Total survival
Number of replanted digits experiencing vascular compromise
Number of replanted digits that underwent a salvage attempt
Number of digits successfully salvaged after compromise
Days until vascular compromise noted
Number of digits that underwent leech therapy
Number of digits that received anticoagulation as a therapeutic intervention for vascular compromise
Number of digits re-explored

replantation, with mean/median LOS of 5.8/5 days (compared to 3.8/1 days after revision amputation).[2,3] Although a longer LOS might be expected after a proximal upper extremity amputation or replantation due to the potentially life-threatening nature of the injury, postoperative care after digit replantation is limited to pain control and replant monitoring. Rates of replant success are dependent on multiple factors, including the nature of the injury, the surgeon's experience, and the institutional volume of digit replantation.[2] The rates of replant salvage are less well characterized. Multiple single-center retrospective studies have presented data on replant success and revision procedures. However, there has not been a published report of replant salvage after vascular compromise in a large or multicenter cohort. Because national data sets (eg, National Surgical Quality Improvement Program, Healthcare Cost and Utilization Project-National Inpatient Sample, etc.) often do not contain enough information to discern the rates of salvage of compromised replants, these data are not reported in epidemiologic studies of outcomes of digit replantation.[3–6]

Previous reports suggest that only 12% of replanted digits have vascular compromise and are salvaged.[7] In a retrospective cohort of 201 replanted digits at a high-volume replant center, Lee et al[8] reported a 10% rate of digits having vascular compromise being successfully salvaged with leeching. Hatchell et al[9] suggest a 63% rate of vascular compromise, with a high rate of salvage (44%) with either leeching alone or with reoperation and leeching. However, there has not been an attempt to systematically synthesize the data from single-center studies to clarify an accurate rate of replant salvage after vascular compromise. To better describe the cost-utility of inpatient monitoring after digit replantation, we determined that a systematic review of the literature on replant salvage should first be undertaken.

The high-stakes nature of the procedure and the significant investments of time and energy into replanting amputated digits may act as barriers for hand surgeons to abandon a salvage attempt. However, it is unclear whether prolonged inpatient monitoring truly helps the patient. The plastic surgery literature suggests there is little utility in monitoring free tissue transfers after the second postoperative day because the risks of vascular compromise and rates of successful salvage are exceedingly low.[10] Interestingly, previous reports note that, like free tissue transfers, up to 80% of compromised digits are detected in the first 48 to 72 hours after surgery.[9,11–13] This raises the question of whether prolonged admission for monitoring, and its associated costs, leads to a reasonable increase in patients' quality of life.

The threshold for "reasonable" cost is debated in the health policy literature, ranging from $50,000 to $300,000 per quality adjusted life year (QALY) gained from a specific intervention. More recent publications suggest that $50,000/QALY should act as a lower limit to cost-effectiveness, while $100,000 to $150,000/QALY should be the threshold used in the United States.[14] The goal of this study was to estimate the cost-utility of prolonged hospitalization after digit replantation, with a specific emphasis on the rates of salvage after vascular compromise.

MATERIALS AND METHODS

Systematic review

Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were used in designing and carrying out our systematic review. Our primary question of interest was how often replanted digits experience a vascular crisis and successful salvage.

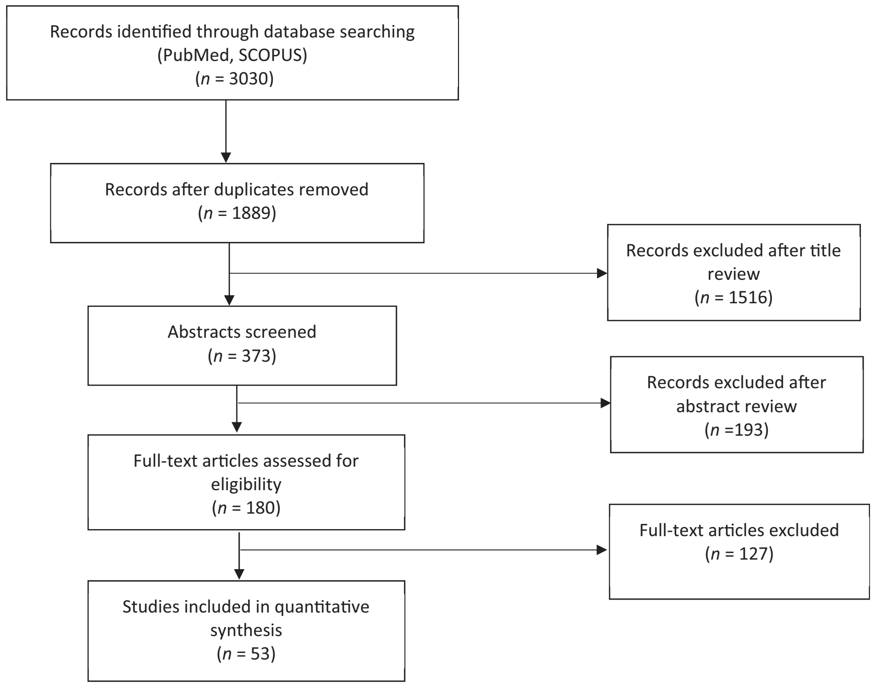

FIGURE 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.

$$ICER = \frac{Avg\ cost\ of\ 1\ night\ inpatient\ stay^{*}}{QALY\ gained\ by\ salvage^{\dagger}}$$

FIGURE 2: Calculation of ICER. *Kaiser Family Foundation.[16] †As reported by Sears et al[7] and Yoon et al.[15]

$$ICER_{NNM} = \frac{Avg\ cost\ of\ one\ night\ inpatient\ stay^{*}}{QALY\ gained\ by\ salvage^{\dagger}} \div NNM$$

FIGURE 3: Calculation of ICER based on the NNM. *Kaiser Family Foundation.[16] †As reported by Sears et al[7] and Yoon et al.[15]

Because many studies do not differentiate between replantation and revascularization (ie, after complete vs incomplete amputation), these results were combined. Two searches, the first more sensitive and the second more directed, were performed in the MEDLINE and SCOPUS databases in February 2020 using the key words "digit," "thumb," "finger," "replantation," "replant," "re-operation," and "outcome," with results limited to English-language results and human subjects. Specific search algorithms are presented in Appendix E1 (available online on the *Journal*'s website at www.jhandsurg.org). After removing duplicate items, our search yielded 1,889 unique references, of which 373 abstracts were reviewed and 180 articles underwent full review based on predetermined inclusion/exclusion criteria and data to be extracted (Tables 1, 2). Ultimately, 53 studies were included in the review (Fig. 1).

We were also interested in examining the overall rate of salvage of compromised digits: that is, the rate of successful salvage of replanted digits after vascular crisis. Finally, although they were not directly used in our cost-utility analysis, we wanted to examine the rate of successful operative salvage, the timing of vascular compromise, and the success of leeching for venous congestion.

Cost utility analysis

Using the data reported by Sears et al[7] and Yoon et al,[15] we began by determining the QALY gained by digit replantation compared to revision amputation, termed "incremental QALY." We considered the data represented by Sears et al[7] a lower limit of QALY, as they use a time trade-off survey in healthy subjects to determine QALY; as pointed out by Yoon et al,[15] this can underrepresent the benefit of digital replantation. In turn, we used the data presented by Yoon et al[15] to represent the upper limit of QALY gained by digit replantation.[7,15]

We then determined the incremental cost-effectiveness ratio (ICER) of inpatient monitoring for multiple scenarios by using the average national hospital-adjusted expenses of inpatient hospitalization ($2,233/day), as reported by the Kaiser Family Foundation (Fig. 2).[16] The ICER is defined as the

TABLE 3. Summative Results of Systematic Review

Variable Evaluated	Number of Articles Reporting Results	Value (%)
Total number of digits	53	5932
Total survival	53	4998 (85%)
Number of digits that both experienced compromise and were successfully salvaged	53	510 (8.6%)
Number of replanted digits experiencing vascular compromise	41	1003 (22%)
Number of replanted digits that underwent a salvage attempt	45	725 (18%)
Number of digits successfully salvaged after compromise*	41	421 (42%)
Days until vascular compromise noted	23	Variable
Number of digits that underwent leech therapy	9	107 (27%)
Number of digits that received anticoagulation as a therapeutic intervention for vascular compromise†	—	—
Number of digits re-explored	23	319 (12%)

*This value differs from the number of digits that both experienced compromise and were successfully salvaged, as it only represents articles where the number of compromised digits was separately and clearly reported.

†Few authors specifically reported using systemic anticoagulation as a therapeutic intervention after compromise.

ratio of the cost of intervention (replant monitoring) to the QALYs gained from the intervention. This presumes that the only reason for continued hospitalization is for monitoring of the replanted digits. Hospital-adjusted expenses, as reported by the Kaiser Family Foundation,[16] are an estimate of the average daily cost a hospital incurs to provide a day of inpatient stay. We assumed that the method used for monitoring is not highly costly and thus does not need to be factored as a separate cost, because clinical examination (ie, color, turgor, capillary refill) is often the primary method of monitoring replanted digits.

The initial ICER assumes, however, that every digit being monitored may develop compromise and can be successfully salvaged. In turn, we calculated the number needed to monitor (NNM), representing the number of replants that would need to be monitored to capture and salvage 1 replant.[10] We then used this number to determine an ICER based on the NNM (Fig. 3) and calculated the day at which the total cost of admission exceeds a lower threshold of cost-effectiveness ($50,000/QALY), followed by the currently accepted cost-effectiveness standard ($100,000/QALY).

RESULTS

Systematic review

Overall, a total of 5,932 digital replants were analyzed in our review (Table 3). The primary outcome of interest—the rate of replanted digits that experience vascular compromise and are successfully salvaged (Table 4, column headers "Number of Successfully Salvaged Digits" and "Total Number of Replanted Digits")—was determined to be 8.6% (510 digits; 95% CI, 7.9%−9.3%). The NNM was then calculated and determined to be 11 (1/0.086; 95% CI, 10.7−12.7). Of the 53 studies included in our analysis, only 41 separately reported the overall number of compromised digits and the number of digits which were successfully salvaged, giving a 42% rate of successful salvage after compromise (421/1,001 digits; 95% CI, 39%−45%). Only 23 studies clearly reported their rate of reoperation for vascular crisis and the success of reoperation separately from nonoperative salvage attempts. Overall, the success rate of reoperation was found to be 50% (159/319 digits; 95% CI, 44.4%−55.3%) and the success rate of leeching alone for venous congestion was found to be 27% (95% CI, 10.1%−44.1%). Twenty studies reported on the timing of vascular compromise, few of which reported granular data. However, of the studies that reported on timing, most compromised digits were reported less than 72 hours after the index procedure. Finally, only 9 studies reported on the use of leech therapy in replant salvage, with 107 digits undergoing leeching. This was heavily influenced by 1 study in which 48/201 digits underwent leeching.[8]

Cost utility analysis

Before adjusting for the NNM, inpatient hospitalization was found to be relatively cost-efficient. Single-digit replantation surpassed the lower threshold of

TABLE 4. Detailed Results of Systematic Review

Author	Date	Total Number of Replanted Digits	Total Success	Total Failures	Number of Compromised Digits	Number of Salvage Attempts	Number of Successfully Salvaged Digits	Days Until Compromise Discovered	Number of Digits Leeched	Therapeutic Anticoagulation	Surgical Re-Exploration
Adani et al[18]	2013	33	29	4	6	6	2	2–8	0	0	6
Agarwal et al[19]	2010	52	48	4	9	5	5	–	5	0	0
Akyürek et al[20]	2002	7	6	1	2	1	1	28–30	0	1	1
Arakaki and Tsai[21]	1993	122	87	35	44	20	9	–	0	–	20
Baek and Kim[12]	1992	38	38	0	7	7	7	1–2	0	0	7
Beris et al[13]	1994	14	9	5	2	0	–	0–2	0	–	0
Breahna et al[22]	2016	75	52	23	33	33	12	0	18	–	15
Betancourt et al[23]	1998	460	425	35	76	–	41	72% <72 hours, 50% in first 24 hours	–	–	–
Buntic et al[24]	2008	23	23	0	0	–	–	–	–	–	–
Baker and Kleinert[25]	1994	32	22	10	10	5	0	Immediate	0	5	0
Cao et al[26]	1996	25	20	5	10	7	5	–	0	0	0
Wen et al[27]	2017	21	20	1	3	2	2	2–3 days	0	0	0
Chen et al[28]	1994	23	18	5	11	11	6	5 days	0	10	1
Chia and Tay[29]	2015	389	321	68	137	137	69	67% <48 hours	0	28	27
Daoutis et al[30]	1993	21	16	5	5	1	0	–	0	0	0
Cigna et al[31]	2015	16	16	0	0	0	0	–	0	–	0
Chiu et al[32]	2019	15	15	0	0	0	0	–	0	0	0
Fakin et al[33]	2015	5	5	0	0	0	0	–	0	0	0
Goldner et al[34]	1990	89	69	20	–	–	10	–	–	–	–
Hatchell et al[9]	2019	83	49	34	52	48	14	80% <48 hours	–	–	5
Lindfors and Marttila[35]	2012	28	19	9	10	–	1	–	–	–	–
Lefèvre et al[36]	2011	16	5	11	11	5	0	Several	5	–	0

(Continued)

TABLE 4. Detailed Results of Systematic Review (Continued)

Author	Date	Total Number of Replanted Digits	Total Success	Total Failures	Number of Compromised Digits	Number of Salvage Attempts	Number of Successfully Salvaged Digits	Days Until Compromise Discovered	Number of Digits Leeched	Therapeutic Anticoagulation	Surgical Re-Exploration
Lee et al[8]	2019	201	154	47	—	—	20	—	48	—	0
Koshima et al[37]	2005	16	13	3	7	7	5	—	0	—	7
Kaye et al[38]	2015	41	19	22	—	8	4	82% <72 hours	8	—	—
Kayalar et al[39]	2017	12	10	2	4	3	1	—	4	1	0
Janezic et al[40]	1996	158	111	47	61	36	14	74% by postoperative day 4	0	61	36
Isenberg[41]	2002	67	58	9	9	2	0	—	0	2	2
Pomerance et al[42]	1997	151	133	18	37	25	19	—	5	0	20
Ozkan et al[43]	2006	6	6	0	1	1	1	—	0	0	1
Ozerkan et al[44]	1995	125	88	37	—	6	3	—	—	—	6
De Smet[45]	1990	10	9	1	1	0	0	—	—	—	—
Ozaksar et al[46]	2012	37	31	6	10	10	4	2	—	—	10
Oruç et al[47]	2017	85	43	42	12	12	4	3	—	—	12
Nikolis et al[17]	2011	277	264	13	41	—	28	—	—	—	—
Niibayashi et al[48]	2000	252	195	57	—	12	4	—	—	—	—
Reagan et al[49]	1994	188	184	4	14	10	8	<48 hours	—	—	10
Cheng et al[50]	1991	802	728	74	153	153	80	—	—	—	72
Troum et al[51]	1995	43	27	16	—	13	9	—	13	—	—
Sharma et al[52]	2005	103	94	9	—	12	8	—	—	—	—
Saies et al[53]	1994	162	124	38	48	—	8	—	—	—	—
Zamfirescu et al[54]	2012	8	6	2	3	3	1	<24 hours	0	—	3
Ward et al[55]	1991	42	26	16	—	5	3	<72 hours	—	12	5
Wong et al[56]	2017	13	13	0	0	0	0	—	—	—	0
Zhang et al[57]	1993	208	196	12	—	29	22	<24 hours	—	—	—

(Continued)

TABLE 4. Detailed Results of Systematic Review (Continued)

Author	Date	Total Number of Replanted Digits	Total Success	Total Failures	Number of Compromised Digits	Number of Salvage Attempts	Number of Successfully Salvaged Digits	Days Until Compromise Discovered	Number of Digits Leeched	Therapeutic Anticoagulation	Surgical Re-Exploration
Hyza et al[58]	2007	6	6	0	1	1	1	<24 hours	—	0	1
Lanz et al[59]	1991	51	45	6	—	10	4	—	—	0	10
Tan and Teoh[60]	1995	10	10	0	3	0	0	—	—	0	0
Mulders et al[61]	2013	144	86	58	—	5	0	—	—	—	—
Gülgönen et al[62]	2007	59	50	9	—	8	2	—	—	—	—
Lafosse et al[63]	2018	15	7	8	13	12	5	—	1	0	0
Tejedor Navarro et al[64]	2021	157	99	58	68	54	7	62% <24 hours	—	12	42
Chen et al[65]	2017	896	851	45	89	—	61	—	0	—	—

cost-effectiveness after 2 days of admission and the upper threshold of \$100,000/QALY at 4 days, which is slightly lower than the national mean LOS (Table 1). Thumb replantation and multiple-digit replantation (2 or more digits) did not exceed this threshold until >10 days. However, when we adjusted for the NNM, these numbers changed substantially. With an average 1/11 digits experiencing compromise and successful salvage, inpatient admission of patients after single-digit replantation is only cost-effective when considering the upper threshold of cost-utility and the upper threshold of incremental QALY, and becomes cost-ineffective on the second day of admission (Table 4). Monitoring after thumb replantation and 2-digit replantation becomes cost-ineffective between 2 and 3 days of admission, and monitoring after 4-digit replantation becomes cost-ineffective at 3 days of admission. A sensitivity analysis was then performed using the upper and lower limits of our calculated 95% confidence interval for the NNM (10−12 digits). Values for $ICER_{NNM}$ did not change substantially, and so the calculated cost-effective LOS thresholds were not affected (Table 5).

DISCUSSION

Health care costs and health care−associated complications have been a strong driver of enhanced recovery after surgery protocols and reductions in inpatient LOS. Prolonged hospitalization after digit replantation is common in the United States.[2,3] Although hospitalization for pain control and management of other injuries can prolong the LOS, patients with the same injuries undergoing revision amputation are often discharged within 1 day of admission.[2] Other than managing postoperative physiologic derangements (ie, hypotension, anemia, etc.), replant monitoring is a major reason for inpatient admission after digit replantation. Although postoperative anticoagulation is a common practice after digit replantation that can contribute to prolonged hospitalization, multiple studies have shown it has no effect on overall outcomes.[17,66] In addition, routine systemic anticoagulation has largely been abandoned in other microsurgical practices because it has not been shown to decrease rates of thrombosis.[67−70] Our data suggest that the average LOS after digit replantation in the United States far exceeds the cost-utility of admission for monitoring and possible salvage. This is because rates of vascular crisis and successful salvage are very low. Treating surgeons should consider these factors in determining criteria for discharge after replantation.

TABLE 5. Cost Utility of Inpatient Monitoring of Replanted Digit

Type of Digit Amputation	Incremental QALY (Sears et al[7])	Incremental QALY (Yoon et al[15])	ICER, $	$ICER_{NNM}$, $	NNM* Adjusted LOS Exceeding $50,000/QALY, Days†	NNM* Adjusted LOS Exceeding $100,000/QALY, Days†
1 digit	0.08	0.3	7,443−27,912	74,430−279,120	1	2
				81,873−307,032§		
				89,316−334,944		
2 digits	0.37	0.68	3,283−6,035	32,830−60,350	1−2	2−3
				36,113−66,385§		
				39,396−72,420		
3 digits	0.42	0.68	3,283−5,317	32,830−53,170	1−2	2−3
				36,113−58,487§		
				39,396−63,804		
4 digits	0.5	0.68	3,283−4,466	32,830−44,660	1−2	3
				36,113−49,126§		
				39,396−53,592		
Thumb	0.27	0.4	5,583−8,270	55,830−82,700	1	2
				61,413−90,970§		
				66,996−99,240		

*NNM indicates the number of replants that would need to be monitored to capture vascular compromise and salvage 1 replant.

†Values represent the day of admission at which the threshold would have been exceeded.

§Represents the NNM calculated from our systematic review: the values above and below were calculated in our sensitivity analysis using the lower and upper limits of the 95% confidence interval, respectively.

Overall, digit replantation is associated with improvements in functional outcomes and quality-of-life measures.[18,71-73] Multiple studies have shown it to be a cost-effective intervention.[7,15] Using a time trade-off survey, Sears et al[7] were able to determine QALYs for multiple health states related to traumatic digit amputation after replantation or revision amputation, and found that ICERs were favorable for digit replantation under multiple conditions. More recently, Yoon et al[15] used patient-reported outcomes data to determine health utility and found that digit replantation, even for single digits, may be more cost-effective than previously reported. However, although both studies include facility fees associated with the procedure, neither separately examine the cost of inpatient hospitalization.

Our study has several limitations. The studies included in our systematic review varied in the quality and number of cases presented (5 to 896), which can introduce different sources of bias. Only English-language studies were included in our review, a significant limitation considering the much higher rates of replantation performed in non–English speaking countries. Two studies alone contributed almost a third of the data, giving them increased weight in the overall analysis. However, there were 15 included studies, each with over 100 digits, from various regions of the world and various clinical settings, which strengthens the findings of the systematic review. The majority of included studies were retrospective in nature. In addition, not all studies explicitly or separately reported on the type of vascular compromise (arterial, venous, or both), strategies used for salvage (operative vs nonoperative), or timing of compromise, limiting the breadth of our analysis. Finally, our cost utility analysis is based on the cost of inpatient admissions to the hospital rather than to the payor. Although we believe that it is unlikely the reimbursed amount would not cover the cost of admission for the hospital, it is impossible to discern with certainty as reimbursement is not itemized in such a manner.

Nevertheless, decreasing the LOS presents an actionable cost-savings measure, especially if the likelihood of further intervention is low. As has been shown in free tissue transfer, we found that most vascular crises are detected by the third postoperative day, suggesting that 3 days of admission should represent an upper threshold of admission after uncomplicated replantation.

The possibility of a higher rate of vascular compromise due to patient nonadherence to restrictions is one concern that could discourage surgeons from pursuing an early discharge. However, there have been reports of high rates of replant success in the ambulatory setting, putting into question the utility of overnight admission in some cases.[74] Braga-Silva[74] describes a protocol whereby all patients were instructed to call the surgeon if there were any concerns for vascular compromise, on which they were educated. Approximately 24% of patients (20/85) were reevaluated within 24 hours of discharge, 8 of whom had successful salvage after compromise. The rate of failure in this study was comparable to that which we found in our review (11%). This suggests that the issue of nonadherence can be mitigated by patient education, despite demographic differences in patients undergoing digit replantation when compared to elective free tissue transfer.

There may also be concern that late digital compromise will be missed or undertreated if patients are discharged earlier, leading to an overall decreased rate of successful replantation. Our review of the data suggests that if the same rates of salvage were to be obtained, successful salvage after late compromise would represent approximately 8% of compromised digits, a small percentage of replanted digits overall. In addition, data from free tissue transfer has shown that late vascular compromise is associated with much lower rates of salvage than early compromise and intervention.[75]

Our cost utility analysis suggests that prolonged hospitalization for monitoring of digit replantation should be more closely scrutinized, and that gains in cost efficiency can be made if surgeons are more selective in their postoperative admission practices.

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Appendix E1. Database Search Algorithms

SCOPUS:

1. (TITLE-ABS-KEY (avulsion OR amputation OR “digital replantation” OR replants OR replantation OR replanting OR retransplantation OR reattach OR replacement) AND TITLE-ABS-KEY (success OR failure OR survival OR successful OR salvaging OR salvage OR salvageable OR optimiz* OR outcome OR functional OR efficiency OR result) AND TITLE-ABS-KEY (“postoperative complication” OR compromis* OR re-operation OR reoperation OR reoperating OR “secondary surgery” OR revascularization OR anastomosis) AND TITLE-ABS-KEY (digital OR finger OR thumb OR digit)) AND NOT TITLE-ABS-KEY (scalp OR limb OR arm OR leg OR pelvis) AND DOCTYPE (ar OR re) AND PUBYEAR > 1989 AND (LIMIT-TO (LANGUAGE , “English”))
2. ALL (digit AND replantation OR thumb AND replantation OR finger AND replantation OR digit AND replant OR thumb AND replant OR finger AND replant) AND (LIMIT-TO (LANGUAGE , “English”)) AND PUBYEAR > 1989

PubMed:

1. (((((“Finger Injuries/surgery”[Mesh] OR avulsion[tw] OR amputation[tw] OR “digital replantation” OR “Replantation”[Mesh:NoExp] OR “Amputation, Traumatic”[Mesh:NoExp] OR replants[tw] OR replantation[tw] OR replanting[tw] OR retransplantation[tw] OR reattach[tw] OR replacement[tw]) AND (digital[tw] OR finger [tw] OR thumb[tw] OR digit[tw]) AND (success[tw] OR failure[tw] OR survival[tw] OR successful[tw] OR salvaging[tw] OR salvage[tw] OR salvageable[tw] OR optimiz* [tw] OR outcome[tw] OR functional[tw] OR efficiency[tw] OR result[tw]) AND Humans [Mesh] AND (“postoperative complication” OR compromis*[tw] OR re-operation[tw] OR reoperation[tw] OR reoperating[tw] OR “secondary surgery” OR revascularization[tw] OR anastomosis[tw]))))) Filters: Publication date from 1990/01/01; English
2. (digit[All Fields] AND (“replantation”[MeSH Terms] OR “replantation”[All Fields])) OR ((“thumb”[MeSH Terms] OR “thumb”[All Fields]) AND (“replantation”[MeSH Terms] OR “replantation”[All Fields])) OR ((“fingers”[MeSH Terms] OR “fingers”[All Fields] OR “finger”[All Fields]) AND (“replantation”[MeSH Terms] OR “replantation”[All Fields])) OR (digit[All Fields] AND replant[All Fields]) OR ((“thumb”[MeSH Terms] OR “thumb”[All Fields]) AND replant[All Fields]) OR ((“fingers”[MeSH Terms] OR “fingers”[All Fields] OR “finger”[All Fields]) AND replant[All Fields]) AND (“humans”[MeSH Terms] AND English[lang]) AND (“1990/01/01”[PDAT] : “2020/12/31”[PDAT])