Evaluation of the Hand Trauma Transfers at a Level-1 Trauma Center after Joining the ASSH Hand Trauma Center Network

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Introduction

Hand trauma remains among the most prevalent and expensive injury types within the United States. However, there remains limited access to specialized hand surgical care throughout much of the country, particularly in rural areas. In 2007, the American Society for Surgery of the Hand (ASSH) and the American College of Surgeons (ACS) established the National Hand Trauma Center Network (NHTCN) to improve coordination and regionalization of hand trauma services.

Criteria for Joining the NHTCN:

- Have a hand surgeon on-call for 24/7 hand trauma
- Perform revascularization and replantation procedures
- Report hand trauma-related data for the network database

In 2019, our institution joined the NHTCN with the aim of expanding access to hand surgery while maximizing efficiency and resource allocation and optimization. The goals of this study are to evaluate how joining the NHTCN affected the volume, demographics, and severity of hand trauma transfers to our institution.

Methods

Data for this study was collected retrospectively over a six-year period from 2016 to 2021 from our institutional trauma registry. Patients were selected based on the criteria of being transferred to our facility due to hand mono-trauma. Analysis of transfer rates, transfer distance, injury patterns, insurance type, path of care, and hospital charges prior to and after joining the NHTCN in January of 2019 was performed using two-sample t-tests for averages or two-sample proportion tests for percentages.

Results

There were a total of 39 hand transfers 3 years prior to joining the NHTCN, and 114 through 3 years after. The average volume of transfers and transfer distance increased significantly after joining the NHTCN, but average charges did not. (Table 1). There was an increase in the number of severe injuries, but minimal change in injury stratification (Table 2). Admission rates, and Medicaid patients requiring surgery decreased, while out-of-state transfers requiring surgery increased (Table 3).

	Pre-network Average (total)	Post-network Average (total)	Change (95% CI)	P-value
Hand Transfers	13 (39)	38 (114)	25 (24.21 to 25.79)	< .0001
Out-of-State Hand Transfers	1.33 (4)	6 (18)	4.67 (3.70 to 5.63)	< .0001
In-State Hand Transfers	11.66 (35)	32 (96)	20.34 (19.48 to 21.20)	< .0001
Transfer Distance	44.03 (1,717.1)	66.61 (7,593.7)	22.58 (3.17 to 42.00)	.0229
Out-of-State Transfer Distance	65.4 (261.6)	78.13 (1406.3)	12.73 (-8.59 to 34.05)	.2274
In-State Transfer Distance	41.59 (1,455.5)	64.45 (6,187.4)	22.860 (0.81 to 44.91)	.0423
Patient Charges	$23,885.00 ($931,515.00)	$33,663.38 ($3,837,625.63)	9,778.38 (-4,546.93 to 24,103.69)	.1795

Table 1: Volume, distance, and charges prior to and after joining the NHTCN

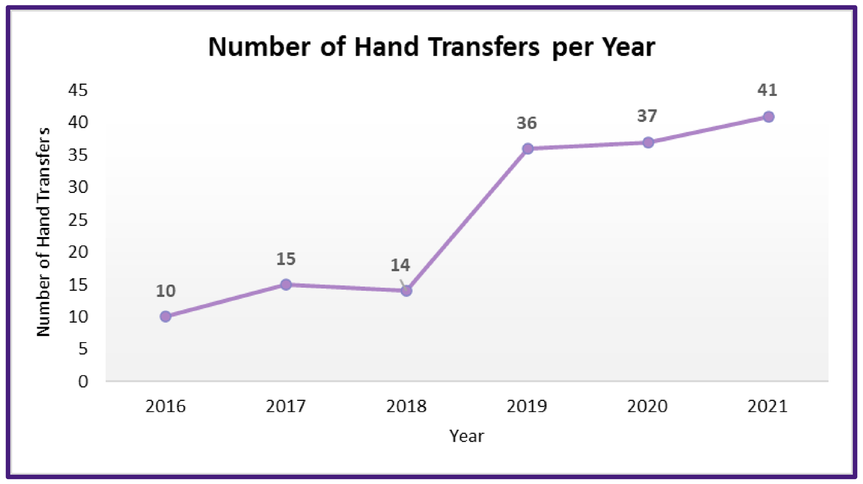

Figure 1: Change in the number of hand transfers per year from 2016 to 2021

	Pre-network Percent (total)	Post-network Percent (total)	Change (95% CI)	P-value
Complete Amputation	10.26 (4)	13.16 (15)	2.9 (-8.46 to 14.27)	.6353
Partial Amputation	33.33 (13)	15.79 (18)	-17.54 (-1.30 to -33.78)	.0186
Open Fracture	25.64 (10)	30.70 (35)	5.06 (-11.05 to 21.17)	.5494
Closed Fracture	0 (0)	14.91 (17)	14.91 (8.37 to 21.45)	.0105
Laceration without Fractures with Nerve or Tendon Injuries	5.13 (2)	11.40 (13)	6.27 (-2.78 to 15.33)	.2553
Laceration Only	5.13 (2)	5.26 (6)	0.13 (-7.91 to 8.18)	.9739
Other*	20.51 (8)	8.77 (10)	11.74 (-1.95 to 25.43)	.0495

Table 2: Stratification of injuries pre- and post-network
* Other:
- Pre-network: Puncture wound with foreign body, puncture wound without foreign body, sprain, open bite, burn, degloving injury
- Post-network: Puncture wound with foreign body, puncture wound without foreign body, contusion, crushing injury, traumatic subcutaneous emphysema, dislocation

	Pre-network Percent (total)	Post-network Percent (total)	Change (95% CI)	P-value
Transfers Admitted	97.44 (38)	70.18 (80)	-27.26 (-17.51 to -37.01)	.0005
Out-of-State Transfers Admitted	75 (3)	77.78 (14)	2.78 (-27.99 to 49.62)	.9067
In-State Transfers Admitted	100 (35)	68.75 (66)	-31.25 (-21.98 to -40.52)	.0002
Transfers Requiring Surgery	64.1 (25)	65.79 (75)	-1.69 (-19.01 to 15.71)	.8487
Out-of-State Transfers Requiring Surgery	25 (1)	77.78 (14)	52.78 (6.20 to 99.36)	.0404
In-State Transfers Requiring surgery	68.57 (24)	63.54 (61)	-5.03 (-13.78 to 21.32)	.5950
Medicaid Patients Requiring Surgery	91.67 (11)	60 (24)	-31.67 (-9.87 to -53.46)	.0403
Commercial Insurance Patients Requiring Surgery	41.67 (5)	61.54 (16)	19.87 (-12.64 to 47.37)	.2585
Transfer who made Follow-up	87.18 (34)	82.46 (94)	-4.72 (-10.36 to 15.5)	.4910

Table 3: Path of care for hand transfers pre- and post-network

Conclusion

These findings suggest that joining the network increased patient access to specialized hand surgical care at our institution. Although an overall increase in the quantity of severe injuries was observed, there were only modest shifts in the overall composition of transfers. Optimizing and avoiding unnecessary transfers remains a challenging proposition.

References

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