Surgical Management and Reconstruction Training (SMART) Course for International Orthopedic Surgeons: Saving Limbs after Traumatic Injury

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Purpose: The burden of complex orthopaedic trauma in low-income and middle-income countries (LMICs) is exacerbated by soft-tissue injuries, which can often lead to amputation. The purpose of this study was to create and evaluate the Surgical Management and Reconstruction Training (SMART) Course to help orthopaedic surgeons from LMICs manage soft-tissue defects and reduce the rate of amputation.

Methods: In this prospective observational study, orthopaedic surgeons from LMICs were recruited to attend a 2-day SMART Course. Prior to the course, participants were asked to assess the burden of soft-tissue injury and amputation encountered at their respective sites of practice. A survey was then given immediately and 1-year postcourse to evaluate the quality of instructional materials and impact of the course in reducing the burden of amputation, respectively.

Results: 51 practicing orthopaedic surgeons representing 25 different countries attended the course. None of the participants (0%) reported previously attempting a flap reconstruction procedure to treat a soft-tissue defect. Prior to the course, participants cumulatively reported a range of 580-970 amputations performed each year as a result of soft-tissue defects. Immediately after the course, participants rated the quality and effectiveness of training materials to be a mean of 4.4 or greater on a Likert scale of 5 (excellent) in 14 of 14 instructional criteria. Of the 34 (66.7%) orthopaedic surgeons who completed the 1-year postcourse survey, 34 (100%, $P < 0.01$) reported performing flaps learned at the course to treat soft-tissue defects. Flap procedures saved 116 patients from amputation. 554 (93.3%) of the cumulative 594 flaps performed by participants 1 year after the course were reported to be successful. 97% of course participants taught flap reconstruction techniques to either colleagues or residents, and a self-reported estimate of 28 other surgeons undertook flap reconstruction as a result of information dissemination by 1-year postcourse.

Conclusion: The SMART Course can give orthopaedic surgeons practicing in LMICs the skills and knowledge to successfully perform flaps and reduce the self-reported incidence of amputation. Course participants were able to disseminate flap reconstructive techniques to colleagues at their home institution. While this course offers a collaborative, sustainable

Table 1. Total Flaps Performed, Total Successful and Total Amputations Averted One Year Post-Course

Flaps	*Total Attempts (n=34)*	*Total Successful (n=34)*	*Success Rate*	*Total Amputations Averted (n=34)*
Soleus	72	67	93.10%	23
Gastrocnemius	107	99	92.50%	20
Cross Finger	69	62	89.90%	15
V-Y Hand	93	89	95.70%	14
Sural	31	29	93.50%	10
Thenar	35	35	100%	5
Latissimus	13	12	92.30%	5
Gluteus	12	11	91.70%	4
Groin	16	13	81.30%	4
Axial	32	32	100%	3
Radial Forearm	9	9	100%	3
Reverse Sural	40	32	80%	3
VY Sacrum	27	26	96.30%	3
Tensor Fascia Latae	5	5	100%	2
Kite	11	11	100%	1
Anconeus	2	2	100%	1
Flexor Carpi Ulnaris	11	11	100%	0
Brachioradialis	1	1	100%	0
Flexor Carpi Radialis	1	1	100%	0
Reverse Radial Forearm	4	4	100%	0
Posterior Thigh	2	2	100%	0
Gracilis	1	1	100%	0
Totals	**594**	**554**	**93.30%**	**116**

approach to reduce global surgery disparities in amputation, future investigation into the viability of teaching the SMART Course in low-resource settings is warranted.

See pages 49 - 106 for financial disclosure information.