summary, the half instrument tie is a simple new technique with significant advantages over the surgeon's knot, providing surgeons an efficient and effective method to tie a square knot under tension.

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PATIENT CONSENT

The patient provided written consent for use of the patient's images.

DISCLOSURE

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Virtual Subinternship in Plastic Surgery: The Start of a New Era in Surgical Education?

Surgical training programs ceased offering in-person subinternships because of the coronavirus disease of 2019 pandemic, stripping medical students of an unparalleled opportunity to gain plastic surgery knowledge and to improve their chances of matching into a program they are interested in.[1] To overcome this hurdle, the University of Pittsburgh implemented a virtual subinternship in plastic surgery.

The virtual subinternship program consisted of a virtual 2-week experience (four students per 2-week block), in which the student participated in synchronous activities (academic, educational, and simulation activities) and asynchronous activities (one-on-one meetings with program faculty). The student also participated in virtual social events with residents. At the conclusion of the rotation, each student was given the opportunity to present a 15-minute talk during grand rounds about their background and clinical/research interests. The schedule and list of sessions are shown in Figure 1, and the questionnaires sent to participants and faculty are shown in Supplemental Digital Content. (**See Appendix, Supplemental Digital Content 1**, which shows the questionnaires sent to participants and faculty, ***http://links.lww.com/PRS/E799***.)

Twenty applicants took part in the virtual subinternship between August and October of 2020. As part of our departmental priority to promote diversity and inclusion, we reserved at least one spot per block for underrepresented minority applicants and accepted equal numbers of female and male applicants. Overall, 18 (90 percent) were U.S. medical students, and two (10 percent) were international medical graduates. Six (30 percent) identified themselves as underrepresented minority. Mean age was 26.9 ± 1.9 years. Mean subjective level of knowledge before and after completion of the virtual subinternship was 2.9 ± 1.0 and 3.8 ± 0.8, respectively, and mean improvement was 0.9 ± 0.8 ($p < 0.0001$). [**See Figure, Supplemental Digital Content 2**, which shows the schematic representation of subjective knowledge before and after the virtual subinternship (*Sub-I*), ***http://links.lww.com/PRS/E800***.] Mean student and faculty satisfaction was 4.8 ± 0.5 and 4.4 ± 0.8, respectively (Table 1).

Subinternships are mutually beneficial for medical students and residency programs.[2–4] Lindeman et al.[4] showed that the most common objective achieved by students enrolling in surgical subinternships was career decision-making. In our study, most participants strongly agreed with having achieved the objectives they desired before participating in the virtual subinternship and having gained plastic surgery knowledge. Drolet et at.[2] showed that the most significant student objective for most program directors and applicants enrolling in a subinternship was finding a "good fit." We found that the faculty strongly felt that a virtual subinternship allows the identification of students who are a good or a bad fit for the program.

This virtual subinternship emerged as a response to the challenges of this era. This is the first study to objectively assess its impact on medical student education and faculty satisfaction. Our data suggest that virtual subinternships offer medical students a highly satisfactory experience by allowing direct involvement with various aspects of a program. We believe that it

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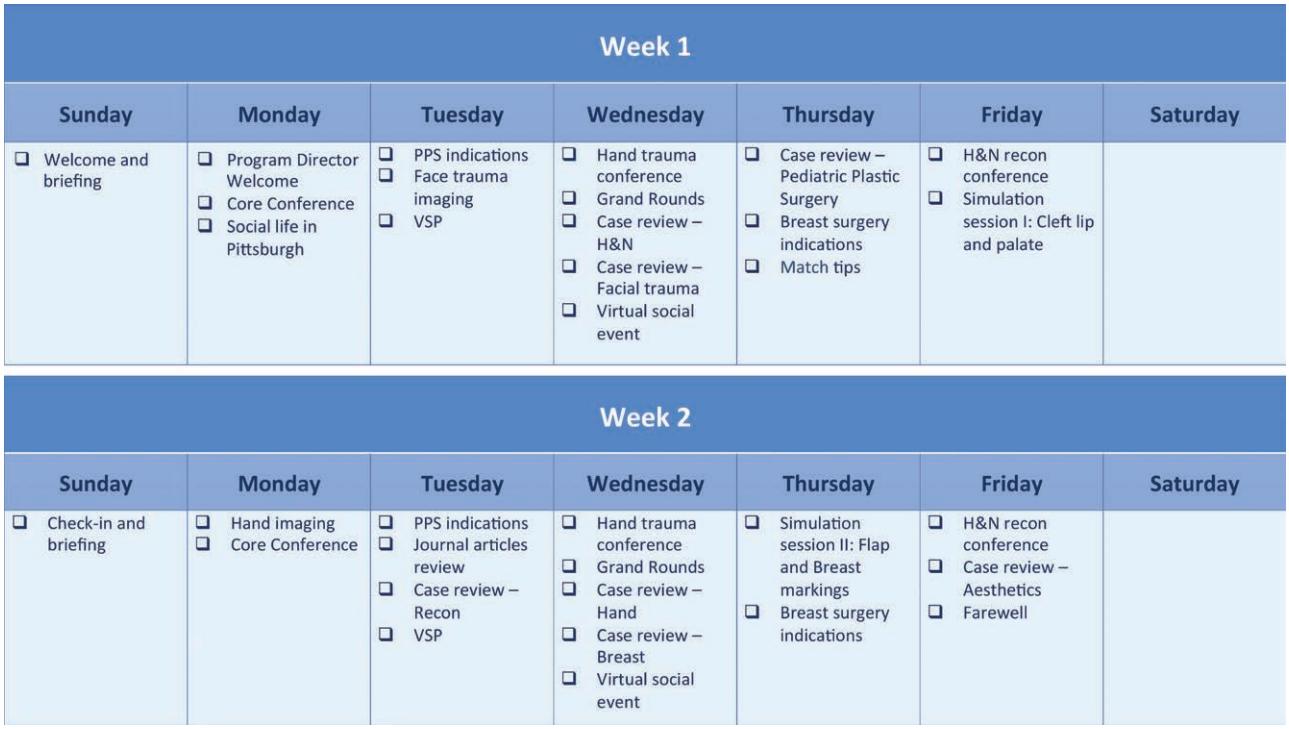

Fig. 1. Schedule for synchronous content of the virtual plastic surgery subinternship. Synchronous material: predesigned educational and simulation sessions and participation in the academic activities of the department including indications conference, journal clubs, grand rounds, and core conferences. Asynchronous material (not shown): one-on-one virtual 20-minute discussion sessions with the leadership and representative program faculty. *CHP*, Children's Hospital of Pittsburgh; *H&N*, head and neck; *PPS*, pediatric plastic surgery; *Recon*, Reconstruction; *VSP*, virtual surgical planning.

Table 1. Reported Participant and Faculty Satisfaction after the Virtual Subinternship

Domain	Mean Score ± SD
Participant ($n = 20$)	
I feel I achieved what I set forth before participating in this subinternship.	4.9 ± 0.4
I feel I gained insight of the clinical volume and breadth of the residency program.	4.8 ± 0.5
I feel I gained insight of the culture of the residency program.	5.0 ± 0.2
I feel I gained insight of the faculty of the residency program.	4.8 ± 0.5
I feel I gained insight of the residents of the residency program.	4.6 ± 0.7
I feel I gained plastic surgery knowledge.	4.9 ± 0.3
Faculty ($n = 7$)	
I feel I gained insight of the medical student's knowledge.	4.1 ± 0.7
I feel I gained insight of the medical student's personality.	4.3 ± 1.1
I feel the virtual subinternship allowed me to identify medical students that would be a bad fit for our program.	4.1 ± 0.9
I feel the virtual subinternship allowed me to identify medical students that would be a good fit for our program.	4.3 ± 0.8
I feel the virtual subinternship is a cost-efficient method of getting to know medical students.	4.7 ± 0.8
I feel the virtual subinternship is a time-efficient method of getting to know medical students.	4.4 ± 1.0
I feel I the virtual subinternship program gave students a good and realistic view of our program.	4.4 ± 0.5
My overall satisfaction level with the subinternship is high.	4.7 ± 0.5

could be used as an adjunct to away rotations in the future or even replace in-person rotations all together, especially if the pandemic persists in 2021. If extensively implemented, these virtual initiatives will also promote equity in the application process, as many more students will have access to more programs. This virtual subinternship curriculum has demonstrated to be a cost- and time-efficient method to deliver plastic surgery education to medical students and to identify potentially good-fit candidates.

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Use of a Wearable Posture-Correcting Device to Train Residents in Plastic Surgery: A Novel Approach to Surgical Ergonomics and Prevention of Associated Musculoskeletal Disorders

Surgeons are highly prone to musculoskeletal injuries at work from maintaining static postures for prolonged periods of time. The "flow state" described by Csíkszentmihályi as a state of absolute focus on the current task—representing nirvana for many surgeons—may have a dark side, as warning signals of discomfort and eventually pain are ignored. However, the prevalence of this problem is underestimated, and effective interventions are not yet explored.[1,2] Multiple studies highlight this, with approximately 80 percent of surgeons experiencing some type of musculoskeletal pain while operating, over 30 percent specifying an occupational injury, 6.7 percent requiring surgical intervention, and 9 percent terminating their operative career.[2,3] This is biomechanically unsurprising, as neck flexion beyond 30 degrees from neutral causes a four-fold increase in the force the cervical spine is subject to.[4]

Postural habits develop during training years for young surgeons and can lead to early musculoskeletal complaints. We recently published a survey of U.S. plastic surgery residents, with 94 percent of responders experiencing pain during surgery, 53 percent of whom reported developing these symptoms during the first 2 years of training.[5] Epstein et al. surveyed program directors across surgical training programs to find that only 1.5 percent provided a formal ergonomics program and 25.4 percent an informal program (isolated lectures and intraoperative directives).[1] Actions such as postural adjustments, microbreaks, and core-strengthening exercises are recommended and may decrease injury risk if adopted.[3] It remains unknown at which point in a surgeon's career prolonged subacute injuries to the body become irreversible and whether there are any modalities of prevention.

After institutional review and approval, surgical trainees wore an external, commercially available, posture-correcting device (LumoLift; LUMO Body Tech, Inc., Menlo Park, Calif.) (weight, 13.6 g; cost, $80) fitted to the back of their surgical caps. The device operates by means of an internal accelerometer that monitors changes in posture. It is calibrated in neutral position and then programmed to vibrate with changes in neck posture beyond a predetermined angle and duration. For the purposes of our study, the device was programmed to vibrate for a change in the angle of the neck greater than 30 degrees for over 1 minute (Figs. 1 and 2). Five trainees of different postgraduate years were recruited to wear the device (postgraduate years 3, 4, 5, and 8, and a subintern) during a diverse set of procedures. Vibrations were delivered anywhere between one and five times (60 percent) to six to 10 times (40 percent) during the procedure (Table 1). Forty percent of participants were able to correct their posture each time the device vibrated. All five participants became more aware of their posture, whether appropriate or not, and subsequently adjusted their posture during the trial. Eighty percent of participants noted greater awareness of their posture in procedures taking place after the trial and 60 percent subsequently modified their posture in subsequent procedures based on increased awareness raised during the trial. Sixty percent were cognizant of wearing the device, but none were bothered by it. In addition, of the three participants that reported existing musculoskeletal symptoms before the study, two reported temporary improvement during the period of wearing the device.

Fig. 1. The posture-correcting device (LumoLift) consisted of an accelerometer and a magnet, calibrated in neutral position.