COVID-19 has renewed calls for reforming health care organization and financing in the United States after pandemic-induced cancelations of health services resulted in substantial economic losses for providers. This impact was particularly severe for surgical specialties, with over $22 billion in-hospital revenue lost under procedure deferrals or cancelations. Emerging evidence suggests that providers operating under alternative payment models such as global budgets, as opposed to fee-for-service models, were insulated from the financial shock of COVID-19 due to the ability to adjust the unit price of inpatient and outpatient services to offset projected volume losses. This trend has significant implications for surgeons, as risk-based payment models shift the onus for cost-minimization and accountability for a given episode of care onto providers themselves. Although attempts to curtail costs in surgery using alternative payment models have been piloted, common procedures within plastic surgery have not yet been incorporated into alternative payment models. However, procedures that are both expensive and performed frequently, such as breast reconstruction, may become candidates for alternative payment models in the future. Consequently, plastic surgeons may benefit from understanding optimal strategies for managing different costs within a surgical episode of care and incorporating lessons learned during the COVID-19 pandemic to help further control costs.

To help guide the adoption of cost-control measures in plastic surgery, this article presents a conceptual framework for mapping costs in surgical care using the five phases model of the American College of Surgeons. By examining cost drivers and delivery innovations at each stage of the care continuum, surgeons can be better equipped to contribute to the design of more cost-effective models of surgical care.
MAPPING COSTS ACROSS THE SURGICAL CARE CONTINUUM

The American College of Surgeons’s five phases model offers an approach for segmenting the distinct processes at each step of care delivery. Figure 1 presents examples of different costs within each of the five phases, and highlights a cost-containment strategy based on the surgical field’s experience during COVID-19.

Preoperative Care
Within the preoperative period, the most significant cost driver in this phase is the decision to operate. Current payment models are based on case volume, incentivizing surgeons to operate more frequently. In contrast, alternative payment models, in which components of a care episode are combined into bundles, have been shown to reduce overall episode costs without a compensatory increase in overall case volume. Within plastic surgery, possible candidates for procedure-based bundles may include repair of distal radius fractures and breast reconstruction. Although considerations remain in defining components of bundles for plastic surgery procedures, this strategy may help curtail costs. The financial impact of COVID-19 may further incentivize payers to adopt procedure-based payment models for more types of surgical procedures.

Perioperative Care
In the perioperative period, patients meet with various care providers before the procedure. During the pandemic, Medicare payment reforms enabled a rapid transition from in-person office visits to telemedicine. In surgery, telemedicine has been used for multimodal prehabilitation, including physical therapy and nutritional support. Although the cost-savings associated with telemedicine have been appeared minimal due to significant upfront capital investment, there are still savings at the patient and payor level driven by reduced patient travel, telemedicine triage, and remote patient monitoring. Further expansion of telemedicine services through the perioperative period has the potential to contribute to cost savings.

Intraoperative Care
During the intraoperative period, important mediators of procedure cost include facility fees determined by the site of service. Site-of-service optimization for cost management is increasingly common, and many cosmetic surgical procedures are now performed in outpatient settings. When controlling for procedure type, procedures performed at ambulatory surgical centers were cheaper and faster than those performed in-hospital outpatient departments, leading to an estimated savings of $363–$1000 per case. Safety comparisons between hospitals and accredited outpatient locations have not shown differences in adverse event rates, demonstrating that ambulatory surgical centers and offices can be safe alternatives to hospitals. Although limitations exist, including limited regulation of office-based procedure sites and challenges posed by patient comorbidities, identifying additional plastic surgery procedures that can be safely performed in ambulatory surgical centers and offices has the potential to induce cost savings.

Postoperative Care
After procedure completion, patients move into the postoperative phase, which encompasses immediate in-hospital recovery. A crucial driver of total admission cost is the length of hospital stay after a procedure. While ERAS protocols span the continuum of care, the resulting cost savings are primarily generated during the postoperative phase through reductions in length of stay. A review of ERAS implementation in breast reconstruction found a significant decrease in length of stay compared with traditional care. Additionally, the use of ERAS pathways in bilateral mastectomy with immediate implant-based reconstruction has enabled same-day discharge.

Takeaways
Question: How can cost-saving measures deployed before and during the COVID-19 pandemic be used to reduce costs in the surgical episode of care within plastic surgery?
Findings: The five phases of surgical care each contain opportunities for cost savings that are relevant to plastic surgery.
Meaning: Plastic surgeons can use the five phases framework to segment surgical costs and understand where savings may be derived.

Cost Centers Across the Five Phases of Surgical Care

| Preoperative | Perioperative | Intraoperative | Postoperative | Postdischarge |
|--------------|--------------|----------------|---------------|--------------|
| Costs of decision to operate, testing, and prehabilitation (weight loss, cardiovascular optimization) | Costs of consultation, coordinating with anesthesiologist, and admission | Costs of labor, equipment used in the surgery and facility fees | Costs of acute care, in-hospital recovery, and risk of readmission | Costs of follow-up consultations, care coordination, and rehab |
| Procedure Selection | Consultation | Site of Service | Discharge Protocols | Recovery and Rehab |
| Alternative payment models | Virtual visits prior to procedure | Hospital versus ambulatory and office procedures | Enhanced recovery versus traditional care | Office-based versus home and virtual options |

Fig. 1. Cost centers across the five phases of surgical care. Adapted from the American College of Surgeons’s “Five Phases” model.
during the pandemic, further decreasing length of stay. Further utilization of ERAS protocols may provide an opportunity to decrease costs for common plastic surgery procedures.

**Postdischarge Care**

The postdischarge period comprises facility- or home-based postacute care and follow-up visits. Site-of-service again has important cost ramifications, as postacute care facilities are significantly more expensive than discharging patients to their homes. New options from CMS for “Hospital at Home” programs offer a more robust framework for at-home rehabilitation. For example, Penn Medicine’s Connected Approach to Recovery program leveraged digital tools to augment home-based postoperative care for breast reconstruction. As Hospital at Home models expand to cover more surgical conditions, the accessibility of home discharges may create a more patient-centered care paradigm and reduce costs.

The COVID-19 pandemic has placed unprecedented pressures on health systems, and procedure-based specialties have been significantly impacted by shutdowns and cancelation of elective procedures. However, despite these challenges, it has also resulted in opportunities for innovation. By examining cost drivers across the phases of surgical care, plastic surgeons can contribute to the creation of long-term strategies that provide value to patients while controlling costs.

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