

Sociotechnical Synthesis

The main problem in the cosmetic surgery industry is a lack of comprehensive understanding and research on both preoperative evaluations and postoperative outcomes. This gap contributes to a high rate of revision surgeries, especially in rhinoplasty, which can be costly, time-consuming, and emotionally taxing for patients. The technical paper shows how physicians often rely on subjective methods to diagnose and treat nasal valve collapse (NVC), leading to less effective initial procedures and more revision surgeries. The STS paper addresses the psychological dimension, revealing that inadequate mental health screenings and weak patient-physician communication can result in unmet expectations. Furthermore, negative societal perceptions after surgery can damage patients' mental health and body image. Together, these papers illustrate how current gaps in pre- and post-surgical processes lead to both physical and psychological complications.

The technical project tackles the challenges in diagnosing and treating NVC, a condition that causes nasal obstruction and breathing difficulties. Nearly 20 million people in the U.S. suffer from nasal airway obstruction annually, and one in four cases is linked to NVC. (Bikhazi et al., 2022; Raithatha & Del Signore, 2023) Current evaluations are largely qualitative and lack standardized, quantitative metrics. Surgical treatments, like cartilage grafting, implants, and suture suspensions, are often based on surgeon intuition, increasing the risk of misjudgment and revision surgeries. This project aims to develop a standardized method and device to improve NVC diagnosis and surgical planning, resulting in better functional and cosmetic outcomes. Through literature review, physician communication, and clinical observation, our team identified nasal valve width as a primary diagnostic metric. This can be measured using a Castroviejo caliper in both the clinic and operating room. To validate this metric, we obtained IRB approval to conduct a chart review and database study on patients undergoing NVC surgery. We also began prototyping an improved one-handed digital tool with enhanced ergonomics for measuring nasal valve width. Patients have responded positively, expressing greater confidence in their physicians when precise measurements are taken. We hypothesize that this method will provide a more accurate diagnosis and treatment plan, as well as, reduce the need for revision surgeries.

The STS project explores the psychological impact of cosmetic surgery, especially rhinoplasty, on patients' mental health and body image. Research performed by Benjamin Jang and Dhaval R. Bhavsar shows that 72.4% of plastic surgery patients have underlying psychiatric conditions, making mental health a vital yet often neglected part of surgical outcomes. (Jang & Bhavsar, 2019) The project argues that psychological motivations, expectations, and social pressures heavily influence whether surgery benefits or harms the patient. Using commodity chain analysis, a framework typically applied to physical products, the project breaks cosmetic surgery into three phases: production (psychological motivations), distribution (preoperative screening and communication), and consumption (postoperative mental health and societal reactions). (Gereffi, 1999) Through case studies, screening tools like SCL-90-R and EARS, and

emerging technologies, the research finds that improved psychological assessments can reduce risks such as regret, addiction, and body image issues. (Mehriar et al., 2017; Naraghi & Atari, 2022) The research stresses that while cosmetic surgery may improve appearance, it can also worsen mental health if psychological readiness and expectations are not properly addressed. This project advocates for a more ethical, patient-centered approach to cosmetic procedures that considers both clinical and social implications.

My technical project has successfully launched a study to examine whether nasal valve width can indicate NVC, while also prototyping an improved measuring device. Although we have gathered preliminary data and begun analysis, a key limitation is that meaningful correlations cannot yet be drawn due to the healing time and delay between enrollment and surgery. Since IRB approval was only received in January, patient enrollment is ongoing, and long-term outcomes are not yet available. Still, we've established a strong foundation for future research. We encourage future teams to continue analyzing data and refining the prototype. The STS paper complements this work by revealing the psychological challenges tied to cosmetic surgery and promoting more rigorous preoperative screening. Its limitations include a lack of diverse cultural data, so future researchers should explore cross-cultural influences, standardize psychological assessments, and study long-term mental health outcomes after surgery.

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