

Observer-ship Report: Department of Next Generation Endoscopic Intervention

Osaka University Graduate School of Medicine

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Overview of Observer-ship Experience

During my observer-ship at Osaka University Hospital under Professor Kiyokazu Nakajima's supervision, I observed follow-up evaluations on patients who underwent his pioneering minimally invasive surgical procedures 10-15 years ago. Observed minimally invasive procedures in the hospital, attended R& D meetings with fellows and industry. Professor Nakajima, globally recognized as a Natural Orifice Translumenal Endoscopic Surgery (NOTES) pioneer, demonstrated exceptional long-term outcomes of his innovative surgical techniques. This observer-ship represents a significant step toward establishing collaborative partnerships between high-income countries (HICs) and low- and middle-income countries (LMICs), particularly in advancing surgical innovation addressing unique healthcare challenges facing Africa and resource-constrained settings.



Professor Nakajima and Dr Moses Isiagi

Clinical Observations and Infrastructure

I observed Professor Nakajima examining six patients who had previously undergone minimally invasive surgical interventions for inflammatory bowel diseases, functional GI diseases, and GI stromal tumours. His follow-up evaluations revealed remarkable outcomes: complete absence of visible surgical scars, excellent long-term functional results 10-15 years post-procedure, full patient recovery, and no procedure-related complications. I also observed his proprietary devices including the Leak Cutter® and Suction Ball Coagulator®.

Osaka University Hospital operates 21 operating theatres with strategic spatial organization enabling rapid expertise sharing and resource optimization. Surgeons can move efficiently between adjacent theatres to provide guidance, facilitating real-time mentorship and efficient sharing of specialized equipment and personnel. This model offers valuable lessons for LMICs: rather than replicating 21-theatre complexes, hospitals could implement "hub-and-spoke" designs with 4-6 core theatres in close proximity, enhanced with telemedicine capabilities. This approach is critical for addressing Africa's projected 8 million surgical workforce shortage by 2030.



The operating theatre with 21 Operating theatres

A particularly impressive component of the infrastructure is the central sterilization unit. A brilliant body of work servicing all 21 operating theatres and outpatient facilities. Staffed by 60 dedicated personnel. This unit employs sophisticated computerized tracking systems where each surgical instrument receives a unique identifier, meticulously tracked from inspection through assembly and packaging. This comprehensive tracking ensures accountability, quality control, and patient safety at every stage of the sterilization process. The scale and efficiency of this operation demonstrate how proper investment in supporting infrastructure, often overlooked in surgical capacity planning is fundamental to sustaining high-volume, high-quality surgical services. For LMICs establishing or expanding surgical capacity, this model underscores that operating theatre numbers alone are insufficient; robust sterilization infrastructure with appropriate staffing and tracking systems is equally critical for safe surgical care delivery.



The Emergency and Trauma Unit demonstrated systematic trauma evaluation, efficient CT scanning utilization, effective triage principles, and seamless interdisciplinary communication, with advanced technology integration including rapid access CT scanning, electronic medical records, point-of-care ultrasound, and automated medication dispensing systems.

Project Engine Lab Day Experience - Kobe

The surgical devices lab day in Kobe profoundly shaped my understanding of surgical innovation and international collaboration. Professor Nakajima and colleagues unveiled groundbreaking developments in ESD technology, particularly AI-enhanced lesion detection, while hands-on laparoscopic training featured progressions from J-Probe system demonstrations to complex VIO300D procedures.



At Kobe with Professor Nakajima instructing the fellows with surgeons and industry

I presented "What is Global Surgery?" highlighting the crisis: 5 billion people lack access to safe, affordable surgical care; 143 million additional surgical procedures are needed annually; by 2030, Africa will face an 8 million surgical workforce shortage; and poor surgical care provision will result in US\$12.3 trillion in economic productivity losses. I explained Surgical Determinants of Health using the PESTLE framework and showcased UCT Division of Global Surgery academic capacity: 10 PhD students, 8 MSc students, 12 MPH-Global surgery students, 25 Executive Leadership participants, and 17 Research Advocacy and Innovations Fellows, representing untapped potential for international collaborations. I advocated for Citizen Science approaches through "Our Voice" methodology, ensuring innovations truly serve end-users' needs. I concluded with the Japanese proverb: "独創的なアイデアは孤独からではなく、議論から生まれる" **"Original creative ideas don't come from solitude, they come from discussions."**



My presentation at Kobe

The afternoon featured hands-on sessions with advanced endoscopic systems and devices at various prototyping stages focused on improving patient comfort and operative technique. Surgical simulations involved public service personnel including coast guards and ambulance crews, demonstrating comprehensive emergency preparedness training.

Cultural Immersion: Understanding Context Through Heritage - Nara Visit

Meaningful international collaboration requires deep appreciation of cultural context. This understanding led me to Nara, where I visited two extraordinary sites illuminating the ingenuity and philosophical foundations shaping Japanese innovation. At Kasuga Taisha Shrine, established in 768 CE, I observed thousands of bronze and stone lanterns maintained meticulously over centuries reflecting the same dedication to long-term outcomes I witnessed in Professor Nakajima's 10–15-year patient follow-ups. The twice-yearly Lantern Festival, where all 3,000 lanterns illuminate simultaneously, reminded me that individual contributions, when carefully coordinated, produce extraordinary collective impact. At Tōdai-ji, the Great Buddha Hall houses the world's largest bronze statue of Buddha Vairocana an engineering marvel from 752 CE requiring 437 tons of bronze and 130 kilograms of gold, demonstrating problem-solving at a scale that seemed impossible for its era. Walking through this wooden structure, I was struck by parallels between 8th-century craftsmen achieving the "impossible" and Professor Nakajima's pioneering NOTES procedures. The temple's history of reconstruction after disasters, each time incorporating lessons learned while preserving essential elements, mirrors the Japanese concept of "kaizen" - continuous improvement - that I

observed throughout my observer-ship. Understanding that Japanese excellence is rooted in centuries of cultural values reinforces that successful global surgery collaboration requires thoughtfully integrating innovations with diverse cultural contexts.



Recommendations for International Collaboration

The University of Cape Town's Division of Global Surgery and Osaka University's Project ENGINE represent complementary approaches to advancing surgical care. Osaka excels in high-technology device innovation; UCT has expertise in addressing surgical care challenges in resource-limited settings. Our students possess deep understanding of contextual challenges facing African surgical care but often lack exposure to cutting-edge innovation processes exemplified by Project ENGINE. Conversely, Japanese students would benefit from understanding how surgical innovations must be adapted for diverse global contexts.

The Project ENGINE model demonstrates exceptional integration between industry partners, academic researchers, and clinical practitioners. Expanding this model to include LMIC perspectives offers industry access to emerging African markets; academic institutions expanded research opportunities addressing global health equity; and healthcare systems improved access to appropriate surgical technology through locally adaptable solutions. Device innovation designed for LMIC contexts could address critical gaps: devices for rural

deployment requiring minimal infrastructure, cost-effective alternatives maintaining quality, and user-friendly devices effective with realistic training opportunities.



Project ENGINE Fellows: During their weekly check, in with Prof Nakajima

UCT's Division of Global Surgery has established collaborations with MIT, Harvard University, WHO, UNICEF, Operation Smile, and COSECSA. Through our master's program and undergraduate electives, over 200 stakeholders have benefited from international placements. Our research networks span 16 African countries, providing implementation opportunities for collaborative innovations. This observer-ship sets the stage for collaboration with Japan, creating opportunities for faculty, staff, and student exchanges focused on surgical device innovation and global health equity.

Conclusion

This observer-ship at Osaka University Hospital, the Project ENGINE lab day in Kobe, and cultural immersion in Nara provided invaluable insights into modern medical practice combining technological advancement with compassionate patient care, rooted in deep cultural traditions of excellence. Professor Nakajima's expertise in minimally invasive surgery, the Emergency Department's efficient operations, and the innovative spirit at Kobe serve as excellent models for healthcare delivery. Yet the full potential of these innovations can only be realized when adapted and made accessible to billions in resource-constrained settings.

By establishing formal partnerships between institutions like UCT and Osaka University, we can create pathways for bidirectional knowledge exchange; development of surgical devices appropriate for diverse global settings; training of surgical innovators with global health perspectives; and research addressing pressing surgical challenges facing underserved

populations. The greatest impact will come from transforming these individual connections into institutional partnerships creating lasting pathways for collaboration, innovation, and ultimately, improved surgical care for patients regardless of geographical or economic circumstances.

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Enjoying Japanese Cuisine and Barbeque with a mixture of South Korea with Prof Nakajima and Ayaka



Enjoying a farewell dinner with Prof Nakajima and the Project ENGINE Fellows

This observer-ship was made possible by the collaboration with University of Cape Town's Division of Global Surgery, and I thank my colleagues and students who continue to drive our mission of advancing surgical care equity. Most importantly, I thank all patients who consented to my presence during their care.

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