

Burden of Free Flap Monitoring on Intensive Care Unit Staff

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Abstract

Introduction: Microvascular free flaps are commonly used to reconstruct oncologic defects in the head and neck. Despite high success rates, monitoring protocols for flap failure are rigorous and can be burdensome for staff in the immediate post operative period. We surveyed intensive care unit (ICU) staff to estimate the nursing time and effort required for flap monitoring and also evaluated the frequency of flap checks needed to prevent a takeback to the operating room.

Methods: A 12-question survey was distributed to ICU nurses asking about the time and effort associated with free flap monitoring. We reviewed all head and neck free flap patients in the immediate two-year period from 2020-2022 preceding the survey distribution to assess the incidence of return to the operating room for flap salvage in the immediate post operative period.

Results: Twenty-seven ICU nurses completed the survey. The majority (14, 52%) felt that free flap monitoring frequently hampered their ability to care for other patients. Almost all (26, 96%) participants stated inadequate time as a primary barrier to effective monitoring. Two hundred patients underwent free flap reconstruction during the study period. Only nine out of two hundred (4.5%) of patients returned to the OR within the first 48 hours for flap compromise, and all were successfully salvaged. In our population, a monitoring protocol of hourly checks in the first 48 hours requires approximately 1,066 flap checks to capture a single critical event.

Conclusions: Frequent flap monitoring imposes a significant workload on ICU nurses due to rigorous flap monitoring protocols, while actionable critical events are rarely observed. With rates of burnout and staff attrition at record highs, this data justifies exploring new technologies and routines in free flap monitoring that may reduce the work burden to better care for our staff while maintaining safety and excellent patient outcomes.

Background

Flap Monitoring:

- Head and neck microvascular free flap (MVFF) reconstruction has success rates between 94-99%.¹
- Most free flap compromise occurs within 48 hours. Salvage in the first 48 hours is associated with significantly higher success rates.
- Flap monitoring methods
 - Physical exam: color match, turgor, capillary refill, temperature
 - Medical devices: implantable vs. portable doppler, duplex ultrasonography, flow coupler, laser doppler, spectroscopy²
- Flap monitoring protocols vary, although many are reported as nursing check every hour for the first 48-72 hours
- 2003 ACGME Duty Hour Regulation inspired flap check and burnout research³⁻⁷
 - 1085 patients from 9 institutions showed no difference in flap loss rate with varying frequency of flap checks between q4h, q8h, and q12h.
 - ICU University Hospitals survey showed 86% of staff met criteria for burnout.

Study Questions:

- How much time do nurses spend on flap checks?
- How effective/impactful are nursing flap checks?
- Are nursing flap checks burdensome and do they impact patient care?

Methods

- 12 question survey to ICU nurses assessing time and effort of MVFF monitoring.
- 2 year retrospective review of head and neck MVFF cases from 2020-2022

Results

Survey:

- 25/27 nurses (93%) felt comfortable and competent caring for MVFF patients.
- 14/27 (52%) felt that free flap monitoring frequently hampered their ability to care for other patients.
- 26/27 (96%) participants stated inadequate time as a primary barrier to effective monitoring.

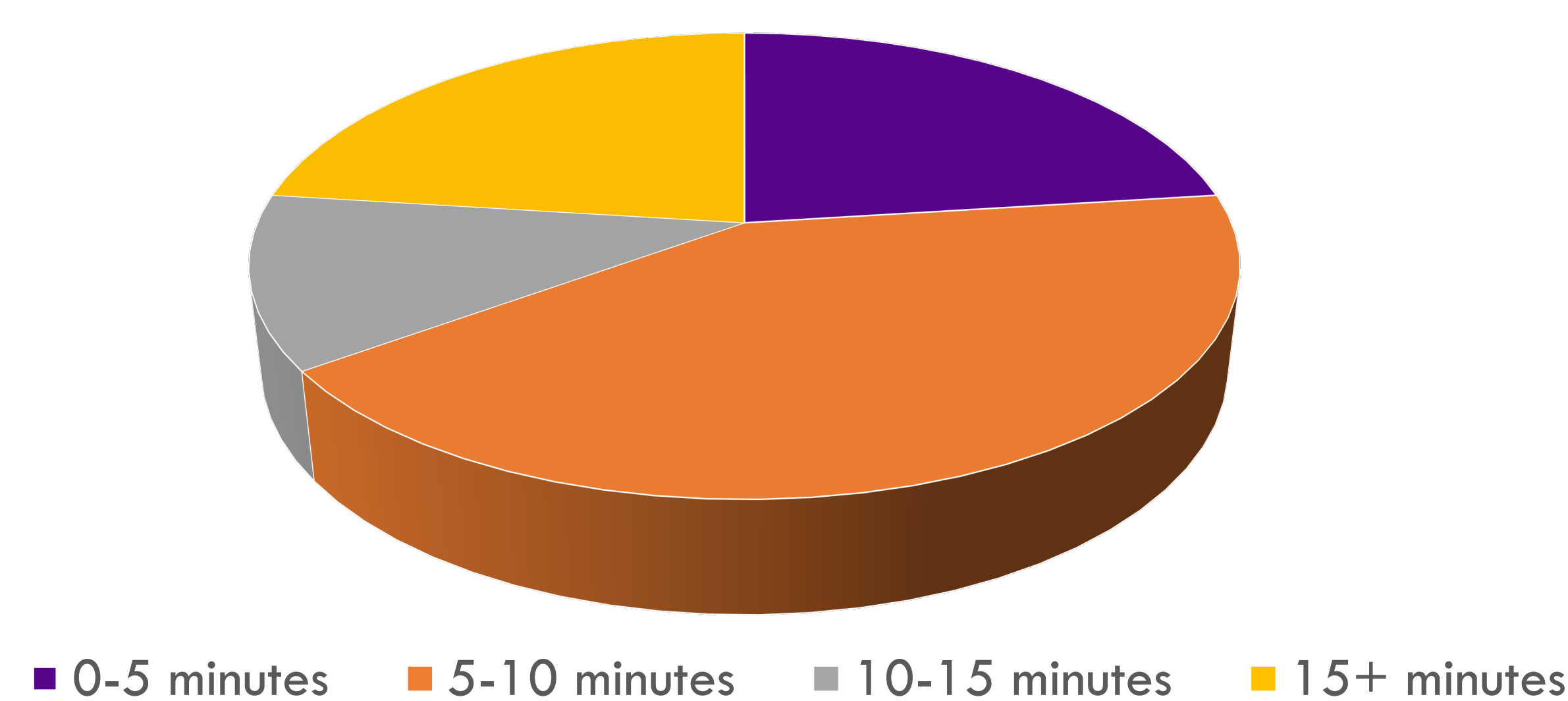
MVFF Cases:

- 200 MVFF cases in the study period
- 9 (4.5%) required returned to the OR within the first 48 hours for flap compromise
- All flaps were salvaged
- **1,066 flap checks** were required to capture a critical event.

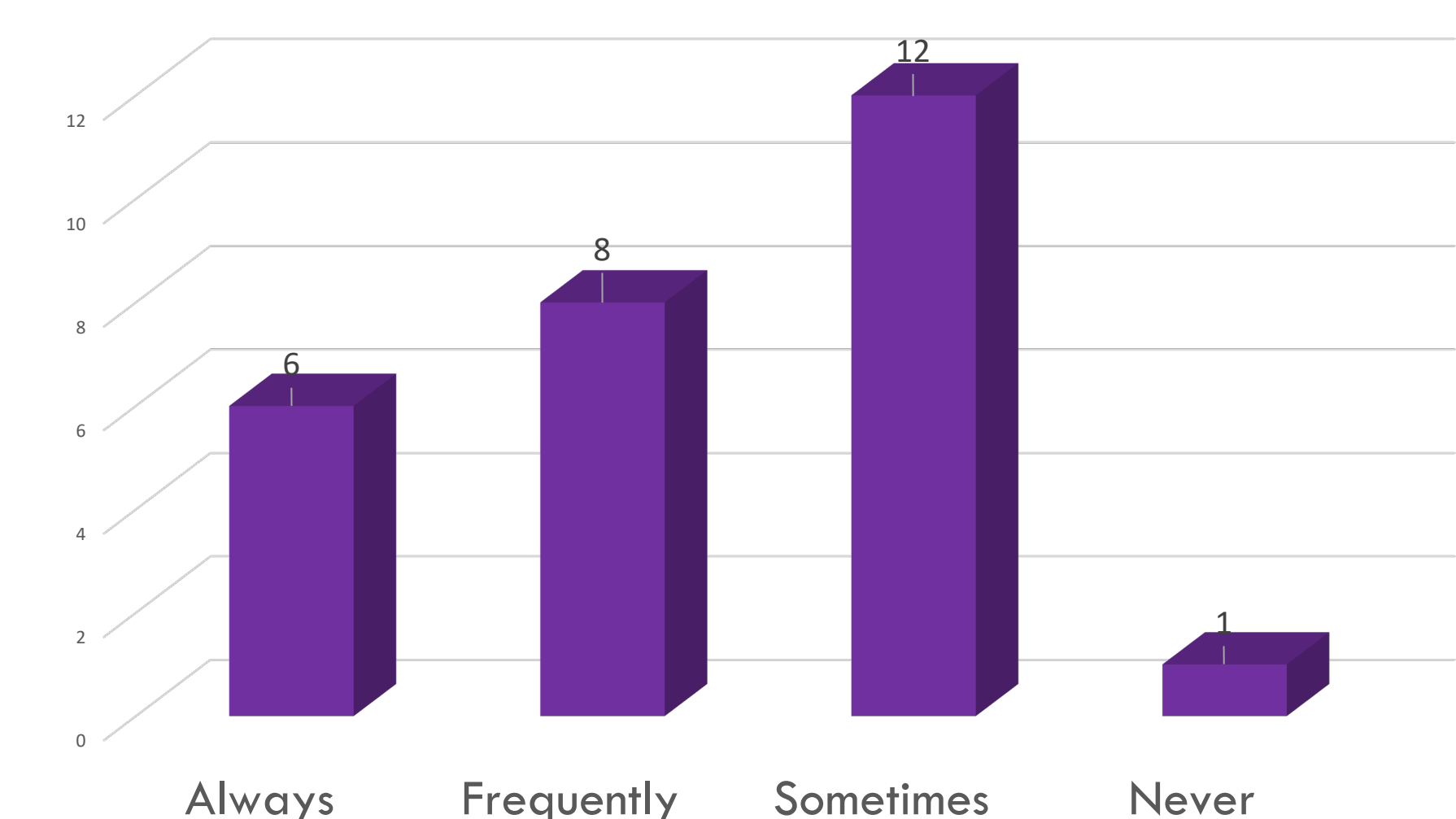
Study Population Characteristics

No. of Nurses	27
Avg. Years in Practice	6.6
No. Nurses Feeling Dread When Assigned MVFF cases	13
No. of MVFF cases	200
No. takebacks in first 48 hours	9
No. of flap checks	9600

Average time to perform flap check



How often nurses felt that flap checks inhibit their ability to care for their other patients

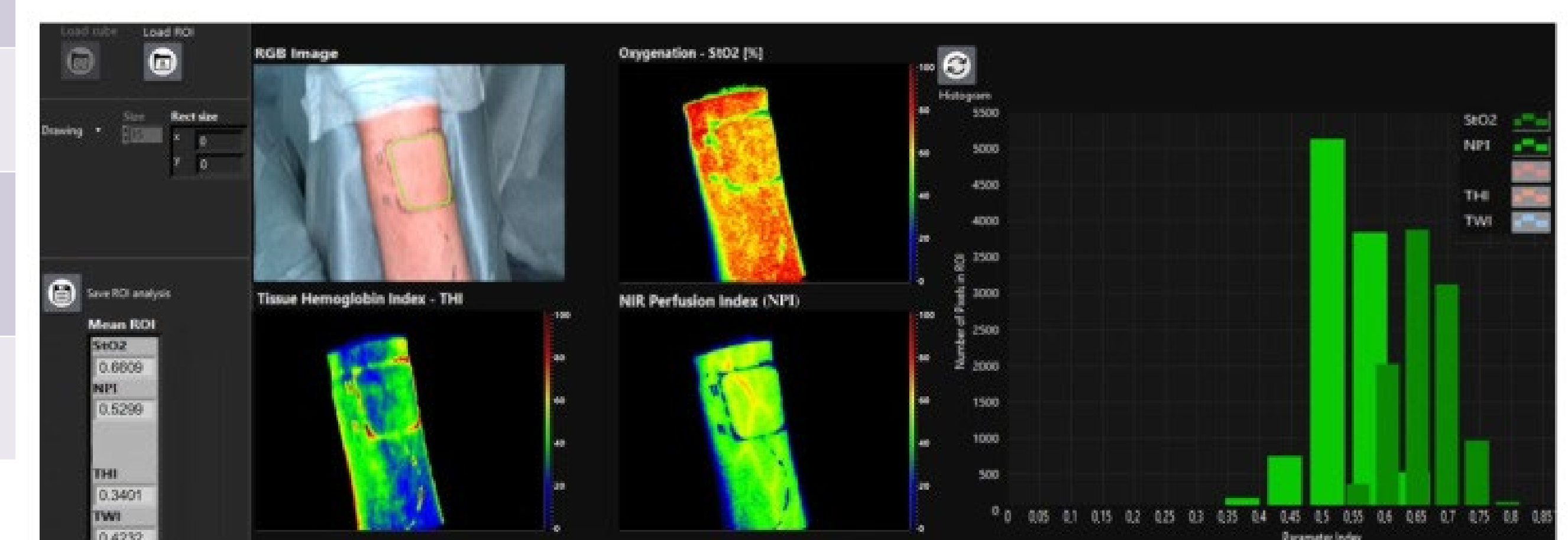


Discussion and Future Directions

ICU nurses spend considerable time monitoring free flap patients due to rigorous protocols despite actionable critical events rarely occurring. New technologies and process changes are worth exploring to reduce the work burden on ICU staff while maintaining safety and success of MVFF reconstruction⁸⁻¹²

Novel Techniques

- Hyperspectral Imaging
 - Near-infrared spectroscopy, distribution of hemoglobin, distribution of water
- Cloud computing-real time remote monitoring
 - Transcutaneous pulse oximetry, implantable doppler
- Artificial Intelligence



Hyperspectral imaging showing perfusion index, tissue oxygen saturation, distribution of hemoglobin, distribution of water¹¹



NIRS tissue oximetry showing arterial insufficiency vs. venous insufficiency¹¹

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