Intra-Operative Video Recording Using 5 Different Camera Systems for An Educational Purpose

National University Hospital

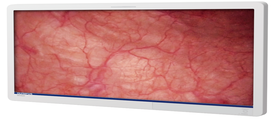
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NUHS National University Health System

Objective:
To assess the characteristics, user experience of different video-recording systems and the added value of intra-operative footages recorded during cardiac surgeries for live-in-a-box video transmissions, education and documentation.

Methods:
There are total of five different camera systems installed in the Cardiac Operating Theatre (OT) at National University Hospital, Singapore. These are (1.) High Defination (HD) Headlight Camera; (2.) Surgical Pendant Camera; (3.) Pan-Tilt-Zoom (PTZ) Camera; (4.) Endoscopic Camera; and, (5.) 360-degree Camera. Integrated footage from the cameras can be viewed as a picture-in-picture on 2 wall-mounted television (TV) screens. The HD Headlight Camera and Endoscopic cameras also have their independent control module and TV-screens. All the camera systems have recording capabilities and their footage can easily be downloaded for editing thereafter. Additional informed consent for intra-operative video-recording was obtained from each patient/parent/guardian prior to surgery.

Results:
Systems recorded the operating field (No.1-3), and the team/OR activities (No.3-5). The headlight-mounted camera (No.1) captured what the surgeon looked at and recorded the entire surgical procedure without interfering with surgical manipulation. The endoscopic camera (No.2) – handheld and/or positioned through a trocar placed in the intercostal space – offered unparalleled close-range high-resolution and magnified images. The overhead camera (No.3) documented interactions of the operative team and the operative field. Ambient cameras (No.4-5) enabled communication in/outside the OT. Integration and editing of the video-audio sources mandated the participation of an online technician during live broadcasts. Recorded footages could further be edited and annotated for documentation and publication. Whereas, parallel utilization of multiple video-recording cameras in the OT could potentially be distractive, none of them hampered surgical flow. In fact, combination of and alternation among the different camera sources made the user-experience universally favourable.



Olympus second wall monitor

Real time projecting the image from endoscopy system/ surgical camera or room camera



Olympus UCES-4
Medical control unit

With a Single Click, SceneSelection Allows Users to Simultaneously Control Multiple Device Settings Following the Procedure Workflow.
including endoscopic equipment, surgical lamps, video management equipment, room lights, from sterile and/or non-sterile touch screens.



(3) Sony Full HD PTZ camera

Ceiling mounting PTZ color camera connected to the control unit to project the image to wall monitor or Zoom for videoconferencing



(1) HD Headlight Camera System

Discussion:
With diligent safe keeping of intra-operative videos, library of video footages can be accumulated. This could be used for quality control, surgical training/education, documentation and scientific publication. We have been using such video footages regularly for aforementioned purposes.

Conclusion:
Different camera systems in the OT have special advantages and they enable content acquisition for recording, live-transmission and live-in-a-box broadcasts. Versatility of and alternation around the multiple image sources minimize disruption in the surgical procedure and translate into a favourable user-experience in content delivery. Multiple further applications of content consolidation are identified in quality control, surgical training/education, documentation and scientific publication.



(4)Endoscopy Tower



(4) Endoscopic Camera – O & 30 Degrees



Camera Control



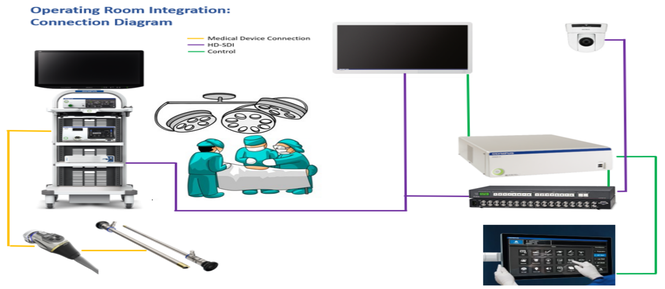
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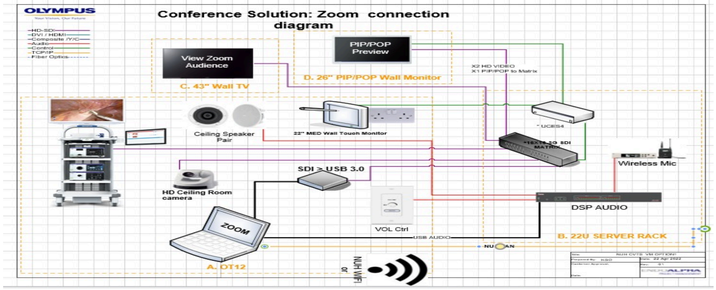
Allows centralized one-touch control of medical devices from the sterile and/or nonsterile field, providing greater efficiency and improved ergonomics during surgery.



Extron Video Matrix

Extron SDI/HD-SDI matrix switchers are designed to switch multiple serial digital video signals





REFERENCES

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2. Floyd W van de Graff, Ozgur Eryigit, Johan F Lange. Updates in Surgery (2021) 73:2001-2007

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