



ÓBUDA UNIVERSITY

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Technical and non-technical skill training and assessment in surgical robotics

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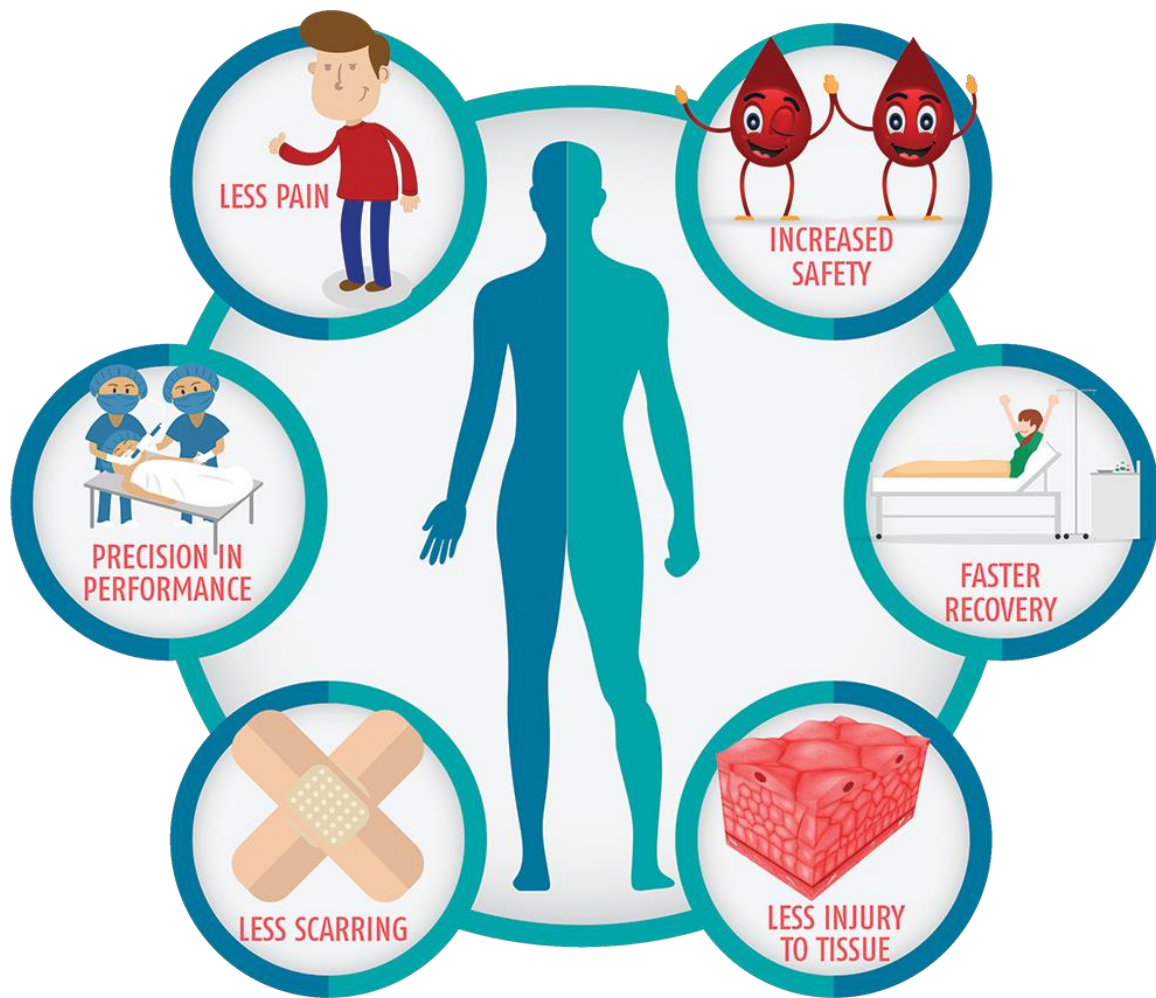


Image credit: <http://gleneagleski.com>

- **Minimally Invasive Surgery (MIS)**
 - Patient side: less recovery time, less pain
 - Surgeon side: hard tasks to learn
- **Surgical skill assessment**
 - Surgical skills define patient outcome
 - Training is crucial
 - Skill assessment: direct feedback, quality assurance
 - Clinical practice does not involve surgical skill assessment



Image credit: <http://www.bbc.co.uk/>

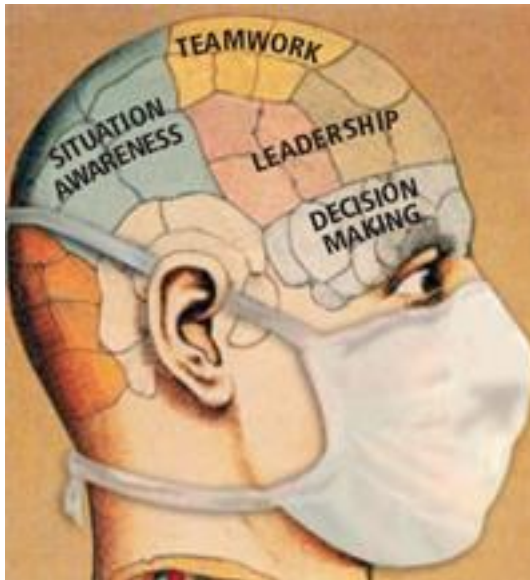


Image credit: <http://notss.rcsed.ac.uk/>

• Technical skills

- Tool handling: knowledge, collisions, fluidity
- Camera handling: depth perception, moving
- Proper strategy, tools, tissue damage, time

• Non-technical skills

- Cognitive skills
- Interpersonal skills
- Personal resource skills

- **Manual assessment**

- Expert panel
- Standardized and validated
- Easy to implement
- Too many resources, biased

- **Automated assessment**

- Computer-based methods
- Link to manual techniques
- No need for resources, objective
- Hard to implement

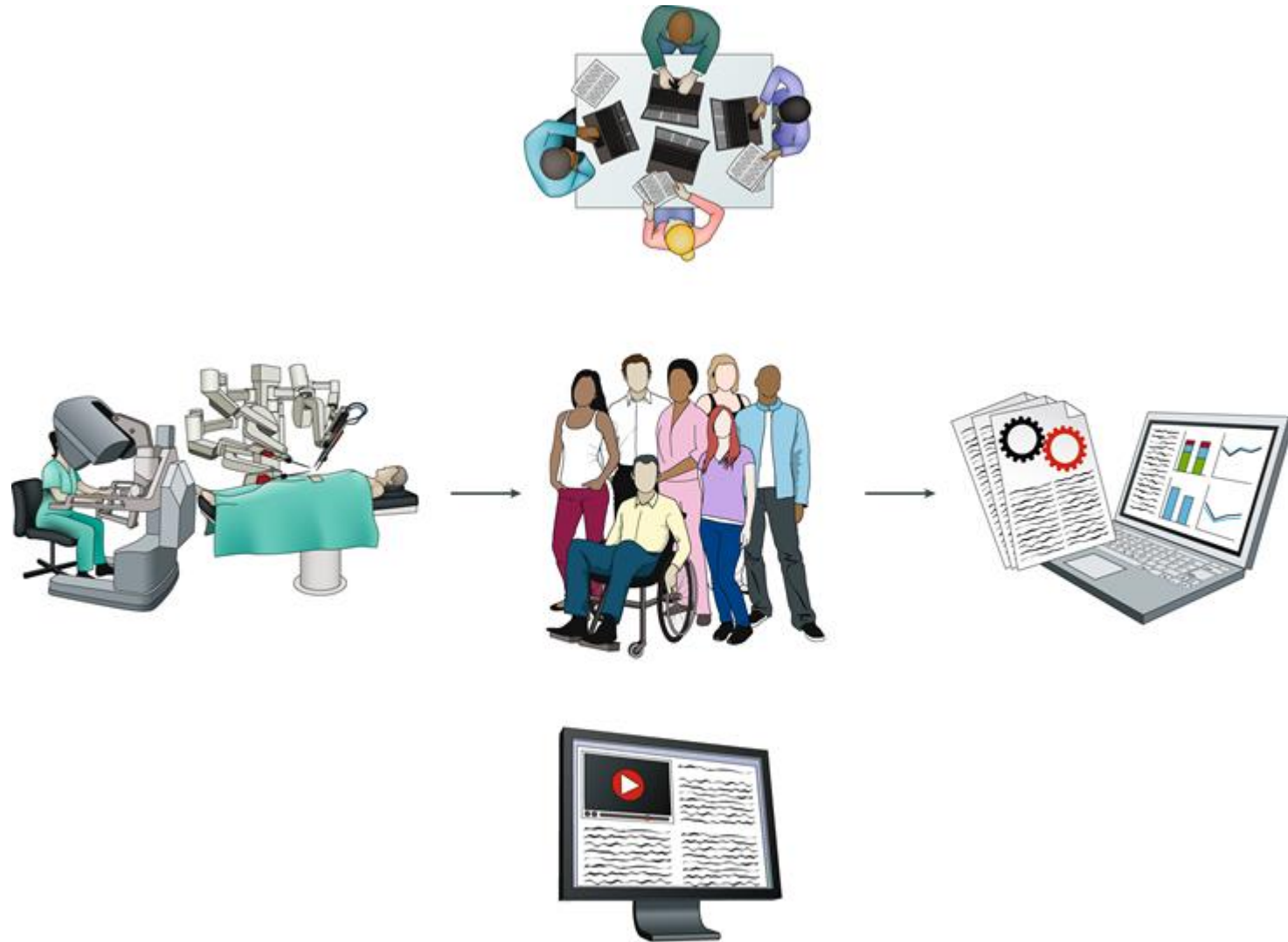


Image credit: <http://www.urologyofva.net>



- **Manual MIS skill assessment**

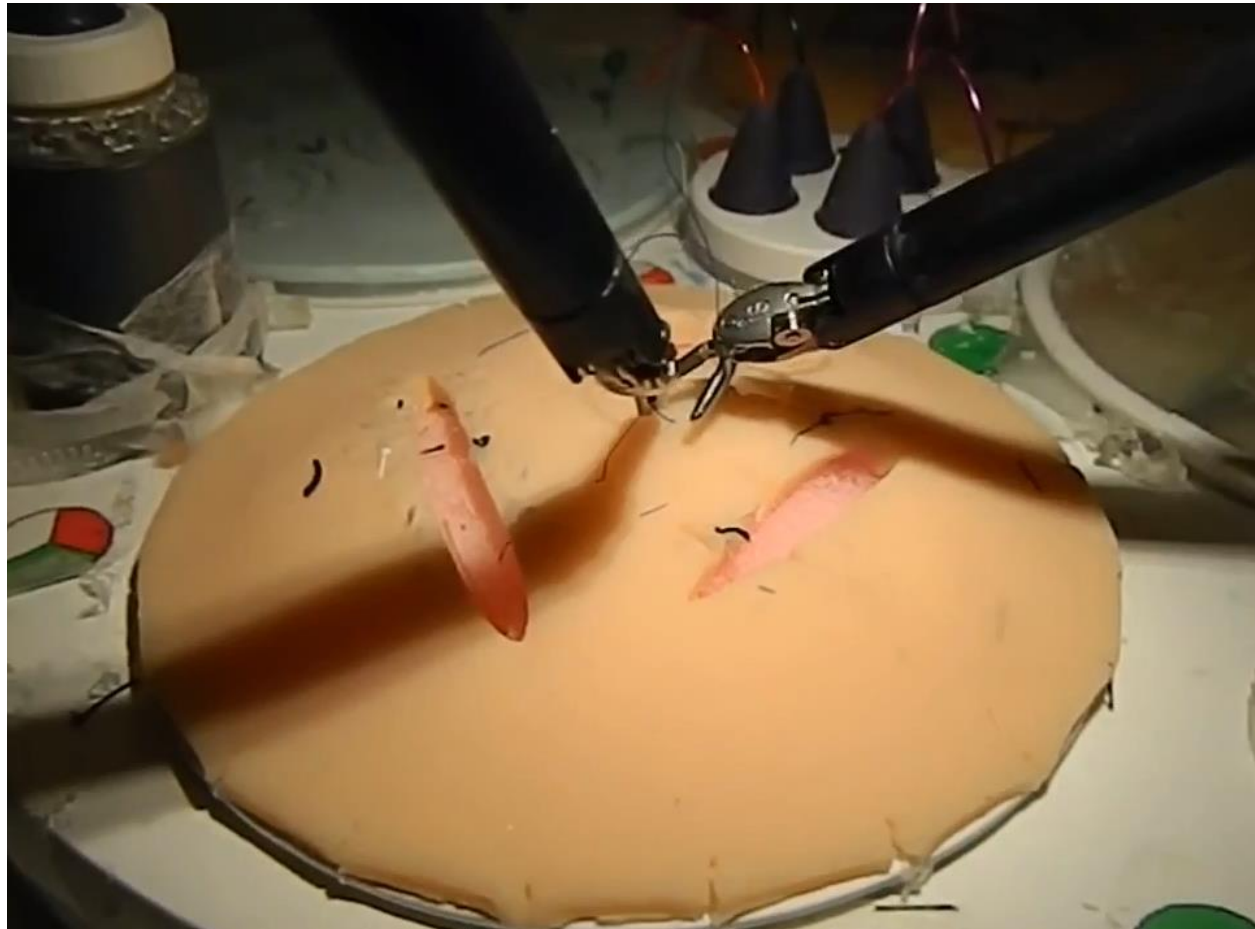
- Video data
- Kinematic data is not available
- No direct feedback

- **Robot-Assisted MIS (RAMIS) skill assessment**

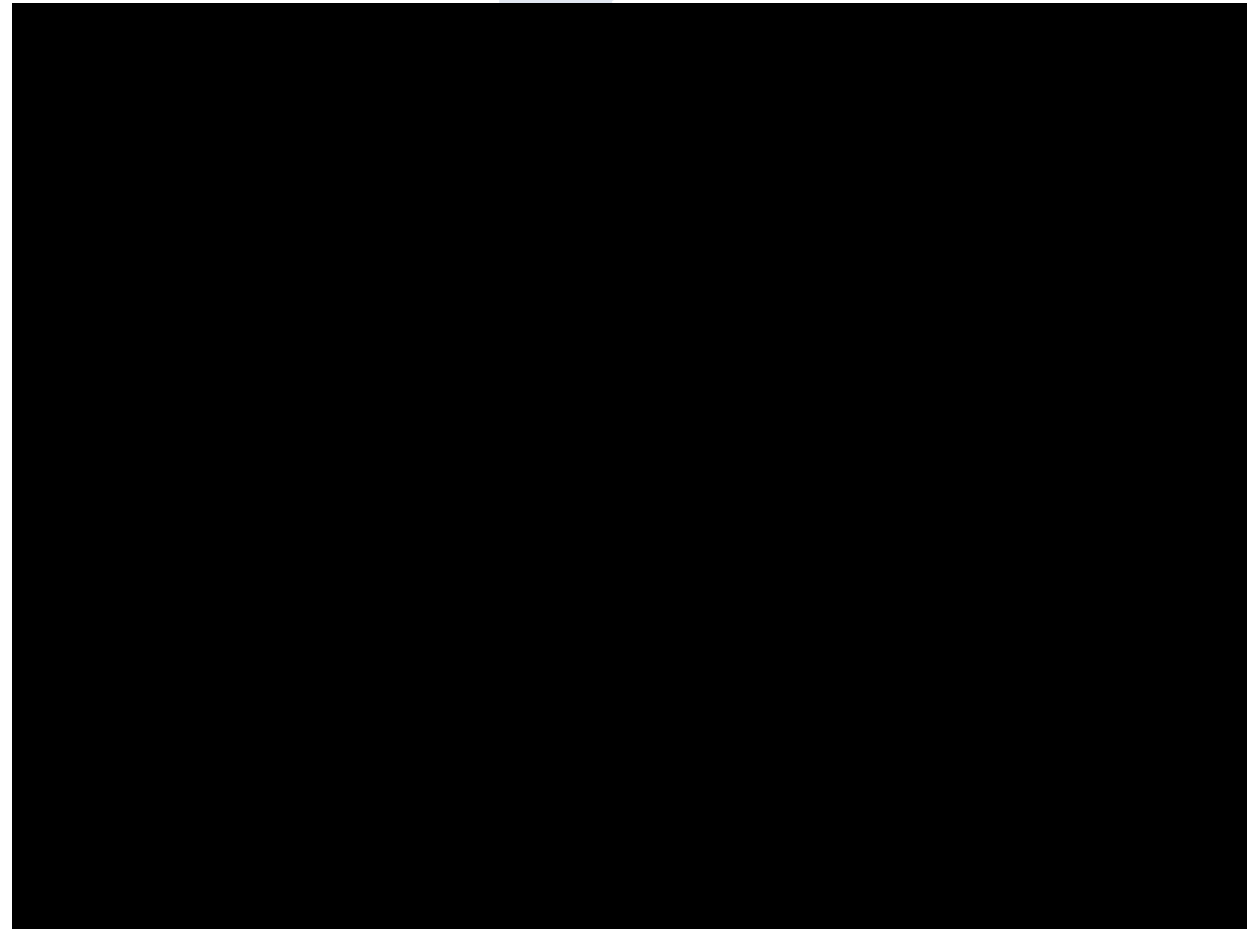
- Stereo video data
- Kinematic data
- Direct feedback
- Platform for automated skill assessment



Image credit: <http://biomedicalcue.it>

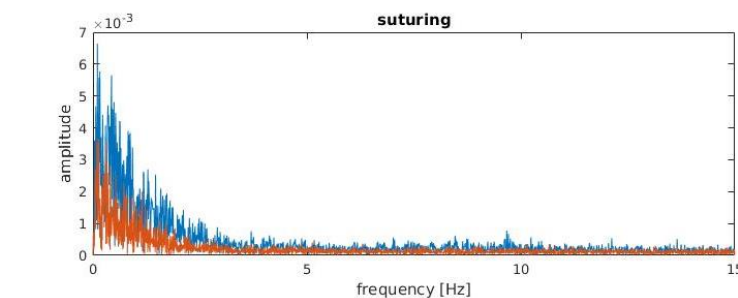
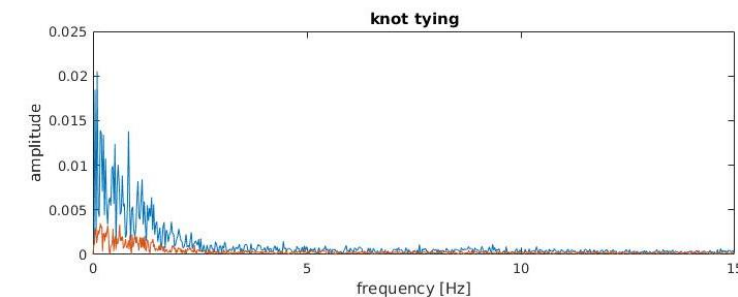
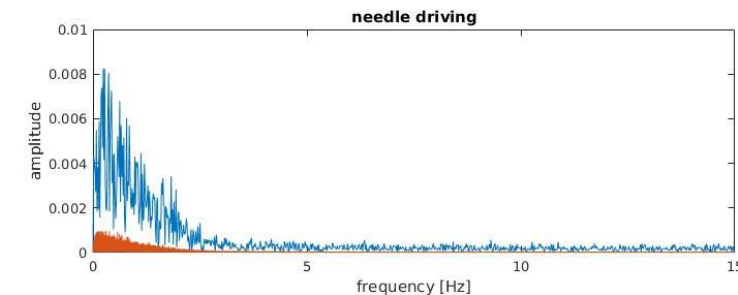
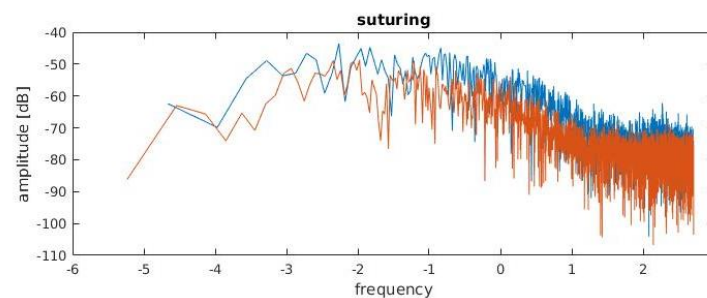
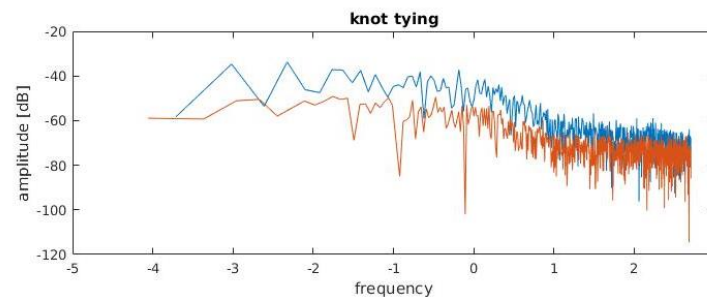
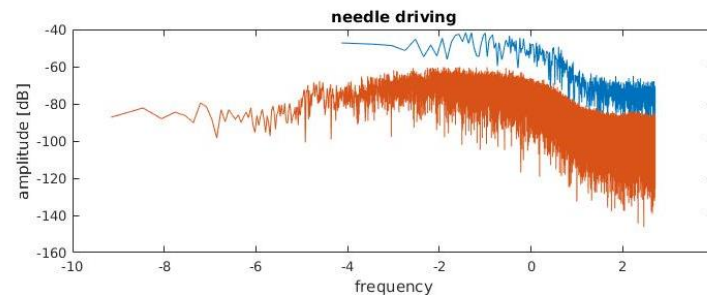


Video credit: <http://https://www.youtube.com/watch?v=-y7D2kMhbSQ>

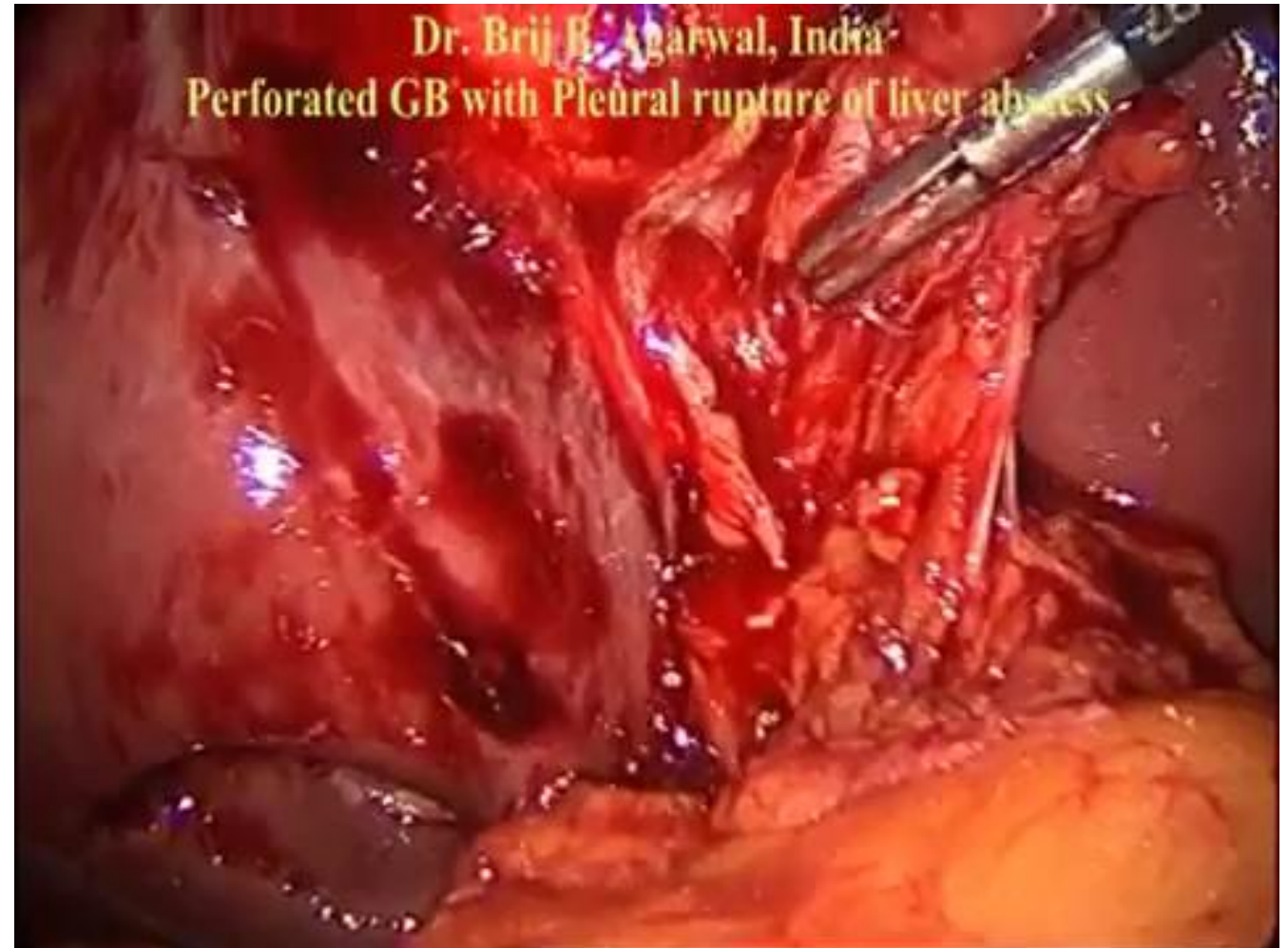


Video credit: <http://https://www.youtube.com/watch?v=utb-8YCvCHY>

- **Technical skill assessment**
 - Skill correlation analysis
 - Learning curve
 - Frequency analysis
 - Video data-based



- **Non-technical assessment**
 - Blunt dissection under stress
 - Blood vessel damage
 - Time critical





Research questions

- How can we measure non-technical skills objectively?
- How technical and non-technical skills correlate to each other?
- How non-technical skills can be effectively trained in case of RAMIS?
- Which parameters define surgical skills the best?

Antal Bejczy Center for Intelligent Robotics

<http://irob.uni-obuda.hu>

R. Nagyné Elek and T. Haidegger are supported through the New National Excellence Program of the Ministry of Human Capacities. Authors thankfully acknowledge the financial support of this work by the Hungarian State and the European Union under the EFOP-3.6.1-16-2016-00010 and GINOP-2.2.1-15-2017-00073 projects. T. Haidegger is a Bolyai Fellow of the Hungarian Academy of Sciences.

Thank you!

