

IMPROVING PATIENT RETURN ELECTRODE TECHNOLOGY

 Rudy Toepfer

BE BOUNDLESS



W

NEEDS STATEMENT

OT/MAINTENANCE/ANESTHESIOLOGY

- > **Current grounding systems for electrosurgery (patient return electrode pads) are costly, even when reused. An improved grounding system for electrosurgery would reduce costs for patients, while maintaining safety and backwards compatibility.**



DETECT

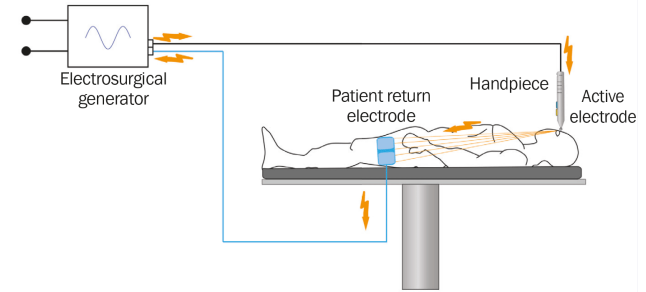
PEOPLE

- > **Surgical support staff must take time to disinfect surgical pads.**
- > **Surgeons experience prolonged surgeries due to poor adhesion.**
- > **Patients at risk of infection or burn.**
- > **Hospital Administration spends money on new pads.**

DETECT

PROCEDURES

- > **Electrosurgery allows cutting and sealing of tissues.**
- > **Electrosurgery is used to minimize blood loss.**
- > **Electrosurgery works by sending high frequency electrical current through human tissues. Heating occurs where current is concentrated at the tool site. Current is dissipated through a large grounding pad.**



DETECT

PRODUCTS

- > **Cables are typically reusable, while pads are not.**
- > **Single use design, but reused 3-4 times for cost savings, until soiled or non-adhesive.**



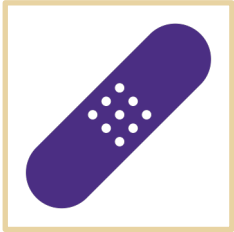
DETECT

PLACES

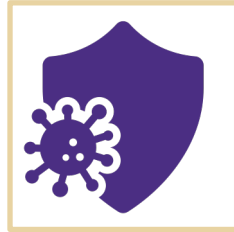
- > Often used in Dhulikhel Hospital OT



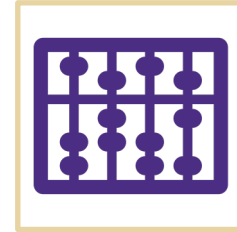
MEASURE



Serious injury or death are extremely uncommon.



Infection due to reused pads is unlikely.



Roughly 7,000-10,000 surgeries are performed per year at Dhulikhel Hospital.

VALUATE



Pads can cost Rs.275 – Rs.800 (Pediatric). Reuse reduces the cost to patients.



Few alternatives exist for unconscious patients. Some surgeries can be performed without electrosurgery, at the cost of greater blood loss.



A simplified design could be manufactured locally.



A reusable design could reduce greenhouse gas emissions.

PROPOSE



More than 90% of surgeries at DH are performed with electrosurgery.



A reduction in pad cost could enable greater access for patients or allow hospital administrators to spend funds on other needs.



Dhulikhel Hospital spends an estimated Rs 1M on grounding pads each year, generating ~50KG of medical waste.

NEEDS + STAKEHOLDERS

> Patients/Surgeons

- Does not cause burns and reduces infection
- Reliable grounding performance
- Minimal patient preparation required
- Does not interfere with pacemakers
- Flexible placement options
- Ground quality monitoring

NEEDS + STAKEHOLDERS

> Surgical Staff

- Reusable to reduce burden on staff (current pads are indicated for single use only)
- No regular maintenance required

> Surgeons


- Device limits leakage currents
- Backwards compatible with existing machines

> Hospital Administrators

- Reduced cost


CONSTRAINTS

 **Patient Safety:** Device needs to be at least as safe as the current standard of care.

 **Basic Functionality:** Device needs to be effective at core grounding function.

 **Clinician Safety:** Existing designs ensure that the surgery is safe for clinicians.

 **Cost:** To be compelling, a new device should reduce costs in the long term.

 **Backwards compatibility:** In order to achieve the greatest adoption and savings, the device should not require the purchase of new hardware.

CRITERIA

HIGHEST PRIORITY

- > **Reusability:** To reduce costs and environmental impact.
- > **Monitoring:** Depending on the setup, current pads can automatically disconnect power if a grounding pad is losing connection with the patient.

CRITERIA

MEDIUM PRIORITY

- > **Patient Prep:** Current pads can be applied in seconds using adhesives. A new device should be able to be set up within a short time frame as well.
- > **Standard of Care:** The potential for a product to become the standard of care could spur investment or manufacturing partnership opportunities.
- > **Maintenance:** Reducing complexity and time spent servicing pads will save money.
- > **Easy Manufacturing:** Simple manufacturing would reduce costs and allow for local manufacturing.

CRITERIA

LOWER PRIORITY

- > **Pacemaker Compatibility:** The use of electrosurgery for patients with pacemakers can be risky today, future designs could mitigate this risk.
- > **Flexibility:** Current pads only come in few sizes, limiting the placements of pads. Pads are generally placed near large muscles.

NEXT STEPS

1. Current ground pads are costly, but effective for single use when used as designed.
2. Future grounding pads could lower costs while offering other benefits, like minimizing patient prep, improving performance for all kinds of individuals, or offering low maintenance.
3. Dhulikhel Hospital already reuses products extensively and could serve as a model for other global institutions to reduce GHG emissions.
4. Well scoped problem for potential KU/UW Bioengineering student capstone. (R&D stage)

IN CLOSING



Thank you: Bikram Thapas, Pratima Benju, Dr. Alex, and Dhulikhel Hospital Staff



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QUESTIONS?

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CITATIONS

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ADDENDUM: POTENTIAL SOLUTIONS

- > **Enhanced disinfection regimen + recondition (reapplication of adhesive) for existing pads**
- > **Modular pad**
- > **Metal electrode product designed for reuse**
- > **Conductive table with enhanced patient monitoring system**