STUDY TITLE

PICO: A prospective, randomized, controlled clinical study to assess the prevention of postsurgical incision healing complications in patients undergoing primary or revision Knee Arthroplasty (KA) or Total Hip Arthroplasty (THA), treated with either Single-Use Negative Pressure Wound Therapy (NPWT) or standard postsurgical dressings.

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RATIONALE

Most surgical wounds heal by primary intention, meaning the wound edges are brought together, or approximated, by some sort of mechanical means (sutures, staples, paper tape, surgical glue or adhesive strips) to heal with minimal scar formation (Gottrup *et al* 2005). National clinical guidelines recommend

that incisions are covered with a postsurgical cover dressing, for up to a period of 48 hours, to help control postoperative bleeding, absorb exudate, provide mechanical protection, help to reduce edema and provide protection from exogenous sources (Mangram *et al* 1999). Multiple patient comorbidities, environmental factors and the type and length of surgery may elevate certain groups of patients into a higher level of risk of developing a post-surgical complication: calling for a higher degree of vigilance and postsurgical intervention. Surgical complications include; wound dehiscence, infection (deep or superficial), hematomas, seromas, tissue necrosis and delayed incision healing. Complication rates can range from 19% in patients requiring open reduction and internal fixation (ORIF) of tibial plateau, pilon and calcaneus fractures (Stannard *et al* 2011) up to 50% in high energy trauma wounds (Stannard *et al* 2006). These complications can have a high degree of morbidity for the patient and further sequelae may result in additional surgical procedures or revisions, a lower functional status for the patient, an increased in length of hospital stay (LOS) and a higher cost for the healthcare provider.

Traditional NPWT has been shown to be an effective adjunct therapy in the treatment of acute and chronic wounds, but the emergence of incisional NPWT (iNPWT) and supporting evidence is growing momentum. *In vitro* studies have shown that iNPWT may help to improve the stimulation of blood flow, help manage exudate, help to reduce edema, provide a mechanical and "splinting" effect on the incision and provide mechanical protection from the environment. Its impact on the prevention or reduction of post-surgical incision complications is still in its infancy, but recent studies pioneered by Stannard *et al* (Stannard 2011) have been encouraging and have demonstrated a statistically significant reduction in infection and dehiscence in patients considered as high-risk following severe skeletal trauma.

The aim of this study is to assess the prevention of incision healing complications in patients undergoing KA and THA treated with either Single-Use Incisional NPWT compared to standard of care dressings.

PRIMARY OBJECTIVE

Compare PICO wound dressing to current MOI standard of care for postoperative incision management in Knee Arthroplasty (KA) or Total Hip Arthroplasty (THA) patients.

Outcome Measures:

- Primary: Incision appearance at 1, 2 and 5 weeks postop
- VAS (Incision Healing Assessment Form) 0-10 continuous, based on standardized digital image (1 week) and exam (2 and 5 weeks). The VAS can be completed by the PI, any of the sub-investigators, or any properly trained physicians or RN associated with the project. If the VAS is completed based on an incisional photo, study staff will collect the exact date the photo was taken.
- If the subject will not be returning 2 weeks postoperatively as standard of care, they will be asked to take another standardized digital image at 2 weeks, and the 2 week follow-up will be done over the phone.

SECONDARY OBJECTIVES

To assess complications between patients treated with either PICO or standard care dressings. **Outcome Measures**:

- Secondary: Daily phone calls for first week; follow-up appointments
    - Drainage amount
    - User-friendliness for patient
    - Complications
    - Return to OR
    - Need for antibiotics

Data Analysis:

- Compare TOTAL PICO vs. SOC incision appearance VAS and drainage amount using t-Test
- Compare Primary JA (joint arthroplasty) PICO vs. SOC incision appearance VAS and drainage amount using t-Test
- Compare Revision JA PICO vs. SOC incision appearance VAS and drainage amount using t-Test
- Compare TOTAL PICO vs. SOC for all other outcome measures using chi-square based on number in each category
- Compare Primary JA PICO vs. SOC for all other outcome measures using chi-square based on number in each category
- Compare Revision TJA PICO vs. SOC for all other outcome measures using chi-square based on number in each category
- Post-hoc assessment of risk factors – ASA level, surgeon, BMI

EVALUATION DESIGN

The study will comprise a prospective, open labeled, single-centre study to determine the efficacy of a Single-Use Negative Pressure Wound Therapy (NPWT) System (PICO) in the prevention of postsurgical incision healing complications in patients undergoing KA and THA. The study will be comparative and randomized according to a pre-determined randomization schedule. The study will be open-labeled due to the physical appearance of both the investigational product and standard dressings, which will be impossible to blind to both the investigator and/or patient. Patients will be stratified according to the type of surgical procedure (KA/THA) and primary or revision procedure. Patients will be followed up for a period of 5 weeks, to determine if there are any latent problems with infection or dehiscence.

NUMBER OF PATIENTS

1000 patients will be enrolled into the evaluation.

INCLUSION CRITERIA

1 – Patient ≥18 years old

2 - Male or non-pregnant females

3 – Patient is scheduled to have a surgical procedure for Knee Arthroplasty (either total knee arthroplasty or unicompartmental knee) or Total Hip Arthroplasty. May be Primary or Revision Procedure.

4 - The patient is able to understand the trial and is willing to consent to the trial

EXCLUSION CRITERIA

1 – Patients who in the opinion of the investigator may not complete the study for any reason

2 - Patients with a known history of poor compliance with medical treatment

3 - Patients who have participated in this trial previously and who were withdrawn

4 - Patients with known allergies to product components (silicone adhesives and polyurethane films (direct contact with wound), acrylic adhesives (direct contact with skin), polyethylene fabrics and super-absorbent powders (polyacrylates) (within the dressing)

5 – Patients not capable of obtaining a standardized digital picture and submitting it to the site.

ASSIGNING PATIENTS TO TREATMENT

Patients who meet all the inclusion criteria will be randomized to treatment according to a pre-determined randomization schedule. Randomization method will be 1:1, PICO versus standard postsurgical dressings, taken from a pre-assigned randomization table. The patient will be randomized to the application of either PICO or standard postsurgical dressings. If a patient is having a bilateral procedure, they will receive the same dressing treatment on both sides.

TREATMENT REGIME

Patients will be assessed against the eligibility criteria to determine their suitability for inclusion in the study.

Pre-Trial	Investigator discusses study with the patient and provides the patient with a Patient Consent Form Patient provides written consent to participate in the study Patient functionality and QoL (quality of life) assessment (SF12)
Day 0	Patient provides written consent to participate in the study (if not done prior to day 0) Complete eligibility checklist, relevant medical history and concomitant medication Patient functionality and QoL (quality of life) assessment (SF12) (*if not done at Pre-Trial visit) ASA level BMI Operative procedure (KA or THA) Incision assessment following procedure First dressing application
Days 1-7 (following surgery)	Daily communication with the subject (in person or phone contact) to collect the following information: o Drainage amount o User-friendliness for subject (including ease of use and subject's opinion of the noise associated with the PICO device. o Assessment of Complications o Assessment of return to OR o Assessment of need for antibiotics

	*On the days within this window that fall on a weekend or holiday, the subject will not be contacted, but rather asked for a summary of this information on the next business day. If the subject is unreachable despite the site's best effort for one or a number of the days in this window, the subject will be asked to give a summary of the "missed" days.
Day 7 (1 week postoperative, +/- 3 days)	Incision appearance: Standard digital photo of the incision (taken by the subject, family member, friend, or caregiver). Subject will submit this photo to the site. VAS (Incision Healing Assessment Form) will be completed based on photo of incision.
Day 14 (+/- 7 days)	Incision appearance: Physician exam; VAS (Incision Healing Assessment Form); Drainage amount; Assessment of complications; Assessment of return to OR; Assessment of need for antibiotics. (If the subject will not be returning 2 weeks postoperatively as standard of care, they will be asked to take another standardized digital image at 2 weeks, and the 2 week follow-up will be done over the phone.)
Day 35 (+/-14 days)	Incision appearance: Physician exam; VAS (Incision Healing Assessment Form); Drainage amount; Assessment of complications; Assessment of return to OR; Assessment of need for antibiotics. Functionality and Patient's QoL Assessment (SF12)
Study Completion	Reason for Study Completion

ADVERSE EVENTS

All adverse events reported spontaneously by the patient or in response to questioning or observation by the Investigator will be recorded.

ETHICS/IRB APPROVAL

Before the start of the trial the Investigator will submit the trial to the local independent Ethics Committee/Institutional Review Board (IRB) for review and approval.

PATIENT CONSENT

Before being recruited to the clinical trial, the patient must have given written informed consent to participate.

REFERENCES

1. Gottrup F, Melling A, and Hollander DA, (2005). An overview of surgical site infections: aetiology, incidence and risk factors. EWMA Journal 5(2), 11-15.
2. Mangram, AJ, Horan TC et al., (1999). The Hospital Infection Control Practices Advisory Committee. Guideline for Prevention of Surgical Site Infection, 1999. Special Report. Infection Control and Hospital Epidemiology, Vol 20, No 4.
3. Stannard, JP, Volgas, DA, McGwin, G, Stewart, RL, Obremskey, W, Moore, T and Anglen JO (2011). Incisional Negative Pressure Therapy After High-Risk Lower Extremity Fractures. Journal of Orthopedic Trauma, Vol 0, Number 0, March 2011.
4. Stannard, JP, Robinson JT, Anderson ER, McGwin G Jr., Volgas MD, Alonso JE., (2006). Negative pressure wound therapy to treat hematomas and surgical incisions following high-energy trauma. J Trauma, 2006; 60(6): 1301-1306.

APPENDIX 1

Patient Risk Grading System

The index values range from 0 to 3 points and are defined by three independent and equally weighted variables. One point is scored for each of the following when present: (1) American Society of Anesthesiologists (ASA) Physical Status Classification of >2, (2) either contaminated or dirty infected wound classification, and (3) length of operation >T hours, where T is the approximate 75th percentile of the duration of the specific operation being performed.

Calculation…….(1) + (2) + (3) = RI

(1) Physical Status Classification, American Society of Anesthesiologists*

Code Patient's Preoperative Physical Status
1 Normally healthy patient
2 Patient with mild systemic disease
3 Patient with severe systemic disease that is not incapacitating
4 Patient with an incapacitating systemic disease that is a constant threat to life
5 Moribund patient who is not expected to survive for 24 hours with or without operation

APPENDIX 2

VAS Scale: PICO Study Incision Healing Assessment Form. Used to represent the assessment of incision healing based on in-person visual appearance, or appearance based on standard digital photograph.