Between 9/2010 and 6/2013, pressure ulcer (PU) surveys demonstrated that the number of patients in the cardiac surgical intensive care unit (CSICU) with hospital-acquired PU (HAPU) per quarter ranged from one to seven.

In the first two quarters after 9/1/2013, when novel "fluid immersion simulation (FIS) OR Table Pads were installed on all CS OR tables, the quarterly rate of HAPU dropped to one to two HAPU per quarter.

In June, 2014, the number of HAPU increased to four (28.6%), including one Stage 4 HAPU, occurring in very high risk cardiac surgical (CS) patients, undergoing life-sustaining therapies in the CSICU.

An expedited Quality Improvement (QI) Project introduced FIS mattresses in the CSICU, in addition to the FIS OR Table pads already in use, to prevent HAPU among CS patients.

### Objective
To prevent HAPU among high risk CS critical care patients.

### FLUID IMMERSION SIMULATION™ (FIS)
- A state of the art pressure redistribution technology
- An advanced microprocessor-driven system
  - analyzes the pressure waveform generated by the patient while sinking into the mattress surface.
  - then, precisely adjusts air density in the mattress to simulate immersion in a fluid medium.
- Mimics floating in water and dynamically reduces undesired soft tissue deformation.

### Background/Significance
- Between 9/2010 and 6/2013, pressure ulcer (PU) surveys demonstrated that the number of patients in the cardiac surgical intensive care unit (CSICU) with hospital-acquired PU (HAPU) per quarter ranged from one to seven.
- In the first two quarters after 9/1/2013, when novel "fluid immersion simulation (FIS) OR Table Pads were installed on all CS OR tables, the quarterly rate of HAPU dropped to one to two HAPU per quarter.
- In June, 2014, the number of HAPU increased to four (28.6%), including one Stage 4 HAPU, occurring in very high risk cardiac surgical (CS) patients, undergoing life-sustaining therapies in the CSICU.
- An expedited Quality Improvement (QI) Project introduced FIS mattresses in the CSICU, in addition to the FIS OR Table pads already in use, to prevent HAPU among CS patients.

### Implementation
- 9/2011: Capital budget request approved for 8 FIS mattresses
- 6/2012: 8-week trial of FIS mattress/bed
- 8/2012: frame without drive function (unacceptable to staff)
- 9/2012: Capital budget request approved for pressure relieving technology, including 8 refurbished bed frames with preserved drive function
- 6/2013: Four-week trial of FIS mattress
- 7/2013: on refurbished critical care bed frames
- 5/2014: Eight FIS mattresses and refurbished bed frames purchased
- 6/2014: Bed frames customized for CSICU
- 7/2014: Over 80 CSICU staff oriented to indications for/operation of the FIS mattress and refurbished bed frame.
- 8/2014: Roll-out of FIS mattresses in CSICU

### Prioritize Conditions for Placement on FIS Mattresses
- Extra-Corporeal Membrane Oxygenation (ECMO)
- Ventricular Assist Device (VAD)
- Open Chest
- Heart and/or Lung Transplant
- Transcatheter Aortic Valve Replacement (TAVR)
- Pulmonary Thrombosis
- Sepsis
- Severely Impaired Oxygenation/Perfusion

### Performance Improvement/Outcome
During the first six months of usage, only 3/18 critically ill patients placed on the FIS mattress in the CSICU sustained either a Stage 2 PU or deep tissue injury (DTI) without progression to high grade PU during prolonged immobilization for life-sustaining therapy.

### Implied Practice Implications
- FIS mattresses are effective at preventing high grade HAPU in critically ill patients who are immobilized for long periods of time
- Expand usage to other groups of critically ill patients at high risk of HAPU.

This project was undertaken as a Quality Improvement Initiative at Massachusetts General Hospital, and as such was not formally supervised by the Institutional Review Board per their policies.