Improving Localization of Chemo Ports

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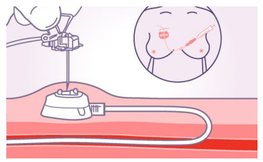
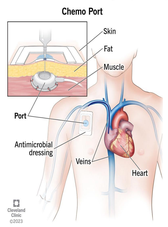
Background

- Patients who need chemotherapy or other infusions/medications on a regular basis have chemo ports implanted into their chest
- This eliminates the need for multiple IV sticks, which increase discomfort, risk of infection and skin irritation, and is a less effective mode of medication delivery
- The chemo port can begin to flip, turn, and migrate in the patient's daily life
- Manual tissue palpation is the current standard of practice for healthcare staff who administer medication; they palpate the port to insert the needle perpendicularly





Existing Solutions & Limitations

Manual tissue palpation does not quantify angle or depth and is ineffective in obese patients; **X-ray** is expensive, not portable, and provides no real-time guidance; **subdermal anchoring sutures** do not quantify angle or depth and must be made at time of placement

Constraints

1.1 Time: 9 months
1.2 Budget: $750
1.3 Policies: Federal Government and Hospital Policies
1.4 Biocompatibility: Materials must be USP Class VI, ISO 10993, or known safe material used in multiple-use medical device (USP)
1.5 MRI Hindrance: Must not hinder or interfere with MRI imaging; patient plan of care

Requirements

2.1 Multi-use Medical Device: USP class VI, ISO 10993

2.2 Location Detection:
- **2.2.1**: Smart Port Standard: ± 5.97 mm
- **2.2.2**: BioFlo Port Standard: ± 6.35 mm
- **2.2.3**: Smart Port Low Profile: ± 5.12 mm

2.3 Depth Detection: 5-38 mm

2.4 Angled Position Detection:
- **2.4.1**: Smart Port Standard: 15°
- **2.4.2**: BioFlo Port Standard: 16°
- **2.4.3**: Smart Port Low Profile: 13°

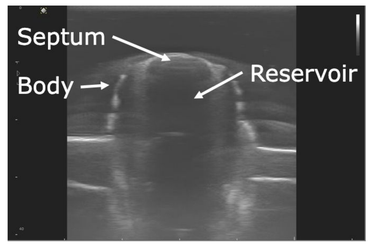
Objective

Use ultrasound technology to quantify chemo port location, depth, and angle for effective medication delivery in patients of all body types

Solution

Our modified ultrasound transducer allows a portable solution for providers to visualize the titanium chemo port and needle placement in real time

A



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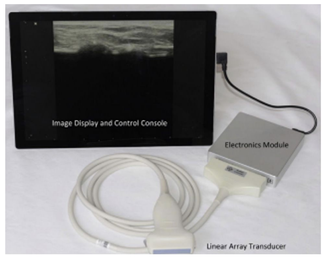

(A) Can visualize center of the port, depth range, and angular position
(B) Easily cleaned, reusable, portable device

Working Models & Prototype

(I) Phantoms to mimic breast tissue
(II) Alterations to existing transducers
(III) Ultrasound software to determine accurate chemo port depth and angular tilt

Verification & Validation

T1 - Depth Detection
Use ultrasound software to measure port depth
T2 - Angle Detection
Use ultrasound software to measure port angle
- *10°: 75-85% accurate*
- *5°: 33.5-59.5% accurate*

Conclusion

Our prototype provides a low-cost, portable, and more effective alternative to conventional chemo port location modalities and will better serve the needs of diverse patient populations

Societal and Economic Impact

TAM $975M
Global obese adult population estimated at **650 million adults**, cancer in obese adults estimated at **5% prevalence**, chemo port usage estimated at **60% of chemotherapy patients:** estimated **10% market penetration**. Product pricing estimated at **$500 unit price** based on budget constraints

SAM $487M; **SOM** $48.7M
50% of applicable healthcare facilities and 10% initial capture rate

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