Cydar Technology And Its AI Modifications Enhance The Accuracy Of Fusion For F/B/EVAR For Complex AAA Treatment: How Does It Work And Reduce Radiation: Advantages And Limitations

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Disclosures

Speaker – Cook, Gore

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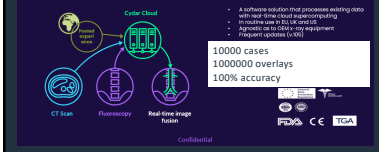
3D Image Fusion

Cydar EV: How It Works

Computer vision watches the X-ray fluoroscopy video



- A software solution that processes existing data with real-time cloud supercomputing
- In routine use in EU, UK and US
- Agnostic as to OEM x- ray equipment
- Frequent updates (+10)

10000 cases
1000000 overlays
100% accuracy

FDA CE TGA

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Cloud GPU computing at petaflop-scale provides the performance and robustness that clinicians demand for surgical guidance.
Data generated by maps continuously improves product performance and enables new features and insights.
AI technology in Cydar Maps includes 3D Image Deep Learning, computer vision with automated 2D-3D image registration and verification.

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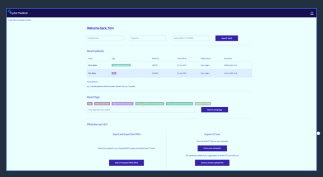
Cydar Hospital Vault

- WHAT IS IT?
  - Your Hospital Vault is a dedicated cloud repository where the Hospital Data resides.
  - The Customer Hospital Retains control of all Hospital Data
  - Controls user access either by 2FA or SSO
  - Sets data retention rules
  - Can view logs
- PACS INTEGRATION
  - The Cydar Gateway (CG) Application sits on VM in Hospital Network. Simple to install and maintain.
  - CG is a PACS proxy node that has been specifically designed to ensure Information Security and Data Availability needed for elective and emergency clinical use
  - No inbound connection permitted. One single outbound connection to the Hospital Vault.



- CLINICAL USERS
  - Import new patient CT scan data
  - View and manage patient lists
  - Plan surgery
  - Preview and review X-ray guided surgery
  - Analyse outcomes
  - Can view automated vigilance and notification systems
- HOSPITAL ADMINS
  - Control authorised user list
  - Can view business intelligence
  - Can receive automated vigilance and notifications
- SUPPORT
  - 24/7 online support for technical assistance.
  - Cydar Companion App (iOS and Android)

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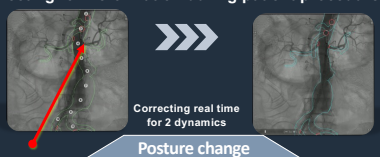
3D Image Overlay

Correcting for Deformation during patient procedures



Correcting real time for 2 dynamics

Posture change
AI correction for intervertebral movement

Patient movement
Tracking the patient • Rigid overlay • sub-mm accuracy

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Intra-Operative Configuration Adjustments

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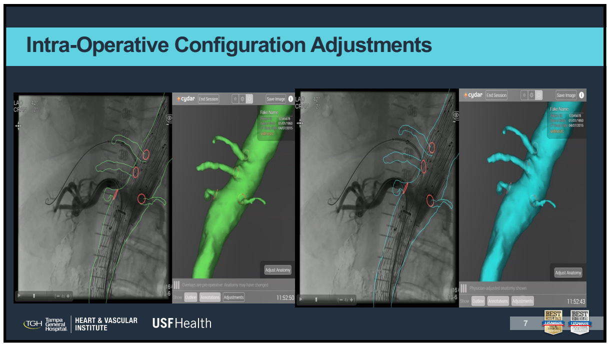
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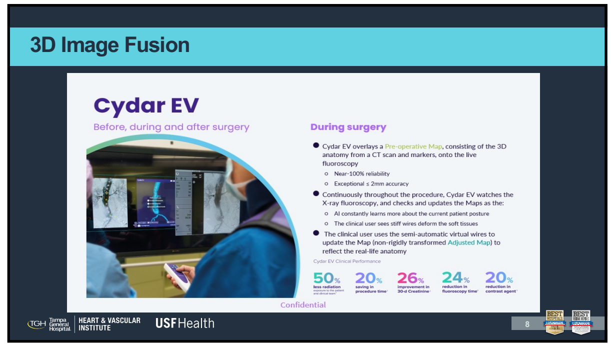
3D Image Fusion
Cydar EV
Before, during and after surgery
During surgery
Cydar EV overlays a Pre-operative Map, consisting of the 3D anatomy from a CT scan and markers, onto the live fluoroscopy
Near-100% reliability
Exceptional ≤ 2mm accuracy
Continuously throughout the procedure, Cydar EV watches the X-ray fluoroscopy, and checks and updates the Maps as the:
AI constantly learns more about the current patient posture
The clinical user sees stiff wires deform the soft tissues
The clinical user uses the semi-automatic virtual wires to update the Map (non-rigidly transformed Adjusted Map) to reflect the real-life anatomy
Cydar EV Clinical Performance
50% less radiation
20% saving in procedure time
26% improvement in 30-d Creatinine
24% reduction in fluoroscopy time
20% reduction in contrast agent
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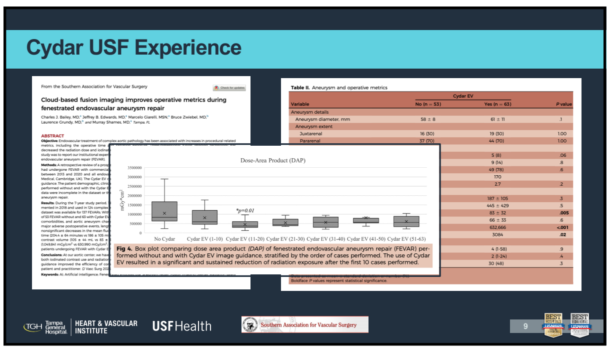
Cydar USF Experience
From the Southern Association for Vascular Surgery
Cloud-based fusion imaging improves operative metrics during fenestrated endovascular aneurysm repair
Charles J. Bailey, MD, Jeffrey B. Edwards, MD, Marcelo Giarelli, MSN, Bruce Zwiebel, MD, Laurence Grundy, MD, and Murray Shames, MD, Tampa, FL
ABSTRACT
Dose-Area Product (DAP)
*p=0.01
No Cydar
Cydar EV (1-10)
Cydar EV (11-20)
Cydar EV (21-30)
Cydar EV (31-40)
Cydar EV (41-50)
Cydar EV (51-63)
Fig 4. Box plot comparing dose area product (DAP) of fenestrated endovascular aneurysm repair (FEVAR) performed without and with Cydar EV image guidance, stratified by the order of cases performed. The use of Cydar EV resulted in a significant and sustained reduction of radiation exposure after the first 10 cases performed.
Table II. Aneurysm and operative metrics
Boldface P values represent statistical significance.
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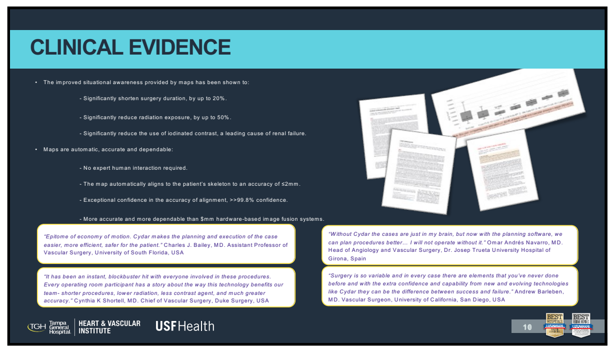
CLINICAL EVIDENCE
The improved situational awareness provided by maps has been shown to:
- Significantly shorten surgery duration, by up to 20%.
- Significantly reduce radiation exposure, by up to 50%.
- Significantly reduce the use of iodinated contrast, a leading cause of renal failure.
Maps are automatic, accurate and dependable:
- No expert human interaction required.
- The map automatically aligns to the patient's skeleton to an accuracy of ≤2mm.
- Exceptional confidence in the accuracy of alignment, >>99.8% confidence.
- More accurate and more dependable than $mm hardware-based image fusion systems.
"Epitome of economy of motion. Cydar makes the planning and execution of the case easier, more efficient, safer for the patient." Charles J. Bailey, MD. Assistant Professor of Vascular Surgery, University of South Florida, USA
"Without Cydar the cases are just in my brain, but now with the planning software, we can plan procedures better… I will not operate without it." Omar Andrés Navarro, MD. Head of Angiology and Vascular Surgery, Dr. Josep Trueta University Hospital of Girona, Spain
"It has been an instant, blockbuster hit with everyone involved in these procedures. Every operating room participant has a story about the way this technology benefits our team- shorter procedures, lower radiation, less contrast agent, and much greater accuracy." Cynthia K Shortell, MD. Chief of Vascular Surgery, Duke Surgery, USA
"Surgery is so variable and in every case there are elements that you've never done before and with the extra confidence and capability from new and evolving technologies like Cydar they can be the difference between success and failure." Andrew Barleben, MD. Vascular Surgeon, University of California, San Diego, USA
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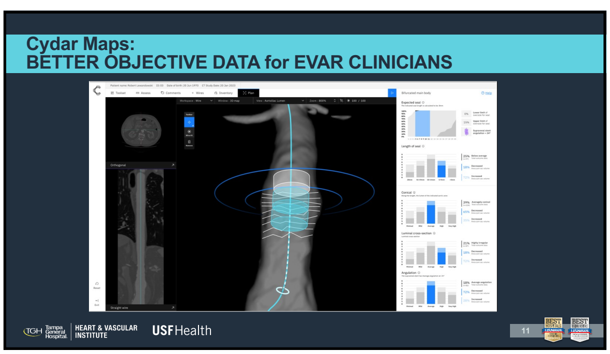
Cydar Maps:
BETTER OBJECTIVE DATA for EVAR CLINICIANS
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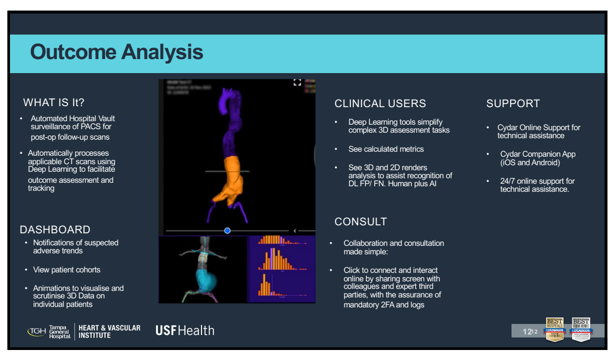
Outcome Analysis
WHAT IS It?
Automated Hospital Vault surveillance of PACS for post-op follow-up scans
Automatically processes applicable CT scans using Deep Learning to facilitate outcome assessment and tracking
DASHBOARD
Notifications of suspected adverse trends
View patient cohorts
Animations to visualise and scrutinise 3D Data on individual patients
CLINICAL USERS
Deep Learning tools simplify complex 3D assessment tasks
See calculated metrics
See 3D and 2D renders analysis to assist recognition of DL FP/ FN. Human plus AI
CONSULT
Collaboration and consultation made simple:
Click to connect and interact online by sharing screen with colleagues and expert third parties, with the assurance of mandatory 2FA and logs
SUPPORT
Cydar Online Support for technical assistance
Cydar Companion App (iOS and Android)
24/7 online support for technical assistance.
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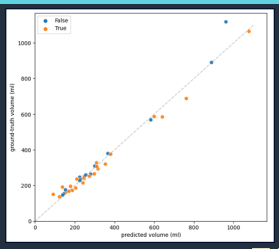
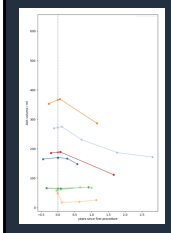
Outcome Analysis



Example:
Assess AAA volume using algorithm:
Segment infrarenal aorta and common iliac (lumen + thrombus) and calculate volume

TRACKING ANEURYSM VOLUME OVER TIME



- **Technology stack**
- DL segmentation of lumen and thrombus
- Automated analysis of lumen and thrombus geometry
- Automated classification of regions of the aorta and iliacs
- DL classification of stent type (make, model)

Summary

- Cydar delivers AI based fusion technology agnostic to imaging hardware
- Demonstrated to improve efficiency and safety of AAA procedures
- Mapping process can be done remotely with AI/online support
- Cloud based fusion continuously updating and improving using 3D deep learning
- Cloud based vault provides storage of preop, intraoperative and post operative imaging with remote access
- Outcome analysis tracks AAA sac volume and provides clinical feedback
- 24/7 technical support