

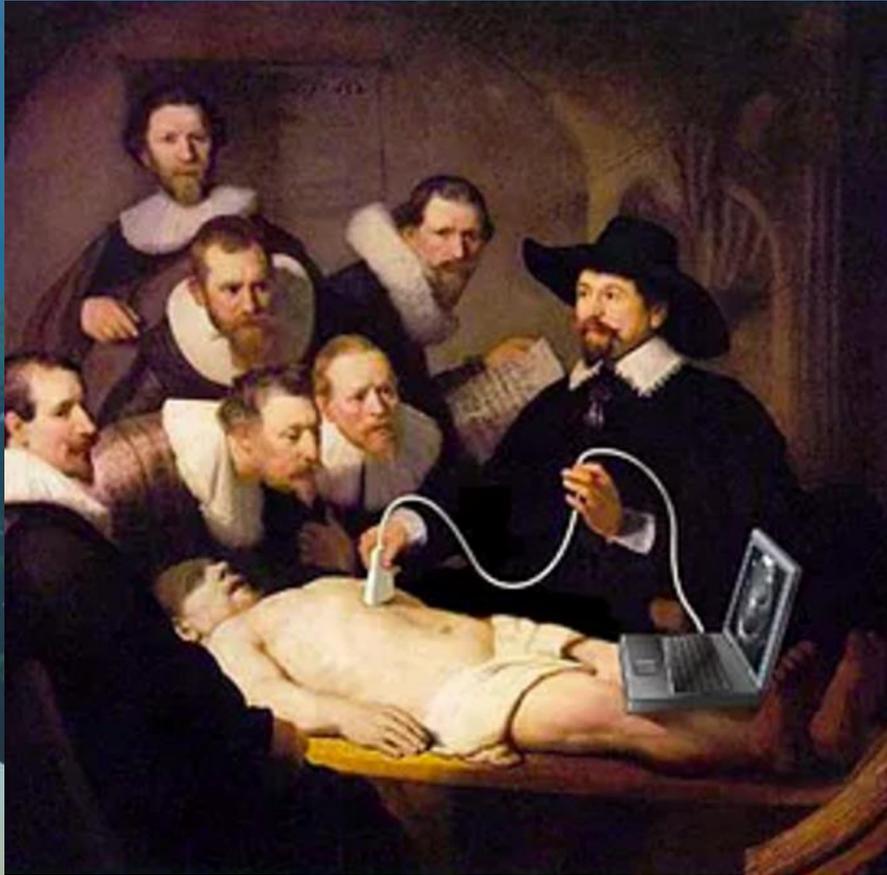
Do You Have A Grip on Point-of-Care Images?

Jeff Agricola

UNC ISD

Daniel Park, MD

UNC Emergency Medicine



HIMSS[®]

NORTH CAROLINA *Chapter*

Objectives



VNA was an evolution,
point-of-care imaging
is a revolution

- What are you really missing?
- How do you create solutions?
- Wrap up and questions

Who we are



Integrated, not-for-profit health care system, owned by the State of North Carolina and based in Chapel Hill.

We provide comprehensive patient care, facilitate physician education and research excellence, and promote the health and well-being of all North Carolinians.

National recognized for leading, teaching, and caring

Nationally recognized for leading, teaching and caring

NATIONAL INSTITUTES OF HEALTH
 100 Great Hospitals In America
 Forbes | 2015 AMERICA'S BEST EMPLOYERS
 Cancer MoonShot 2020
 HealthCare's most wired WINNER 2017
 MAGNET RECOGNIZED AMERICAN NURSES CREDENTIALING CENTER
 NCQA Measuring quality. Improving health care.
 Consumer Reports
 Secretary of Defense Freedom AWARD 2014 Recipient
 LEADER IN LGBT HEALTHCARE EQUALITY HEALTHCARE EQUALITY INDEX
 UNC THE NORTH CAROLINA TRANSLATIONAL & CLINICAL SCIENCES INSTITUTE
 PRESS GANEY Outcomes driven. Performance strong.
 Science BREAKTHROUGH 2014-2015
 doximity TOP RESIDENCY 2014-2015
 HIMSS Analytics STAGE 7
 healthgrades How America finds a doctor.
 BEST PLACES TO WORK MODERN HEALTHCARE
 VOTED BEST Best Doctors 2015
 Nobel Prizes for Science
 2017 Best Hospitals for Nurses North Carolina
 Blue Distinction® AMERICAN COLLEGE OF SURGEONS Verified Trauma Center
 2015 MISSION: LIFELINE GOLD PLUS RECEIVING
 American Hospital Association - McKesson Quest for Quality Prize®
 US News & World Report

HOSPITAL RANKINGS:
 5 nationally ranked adult specialties
 5 high performing adult specialties
 7 nationally recognized children's specialties

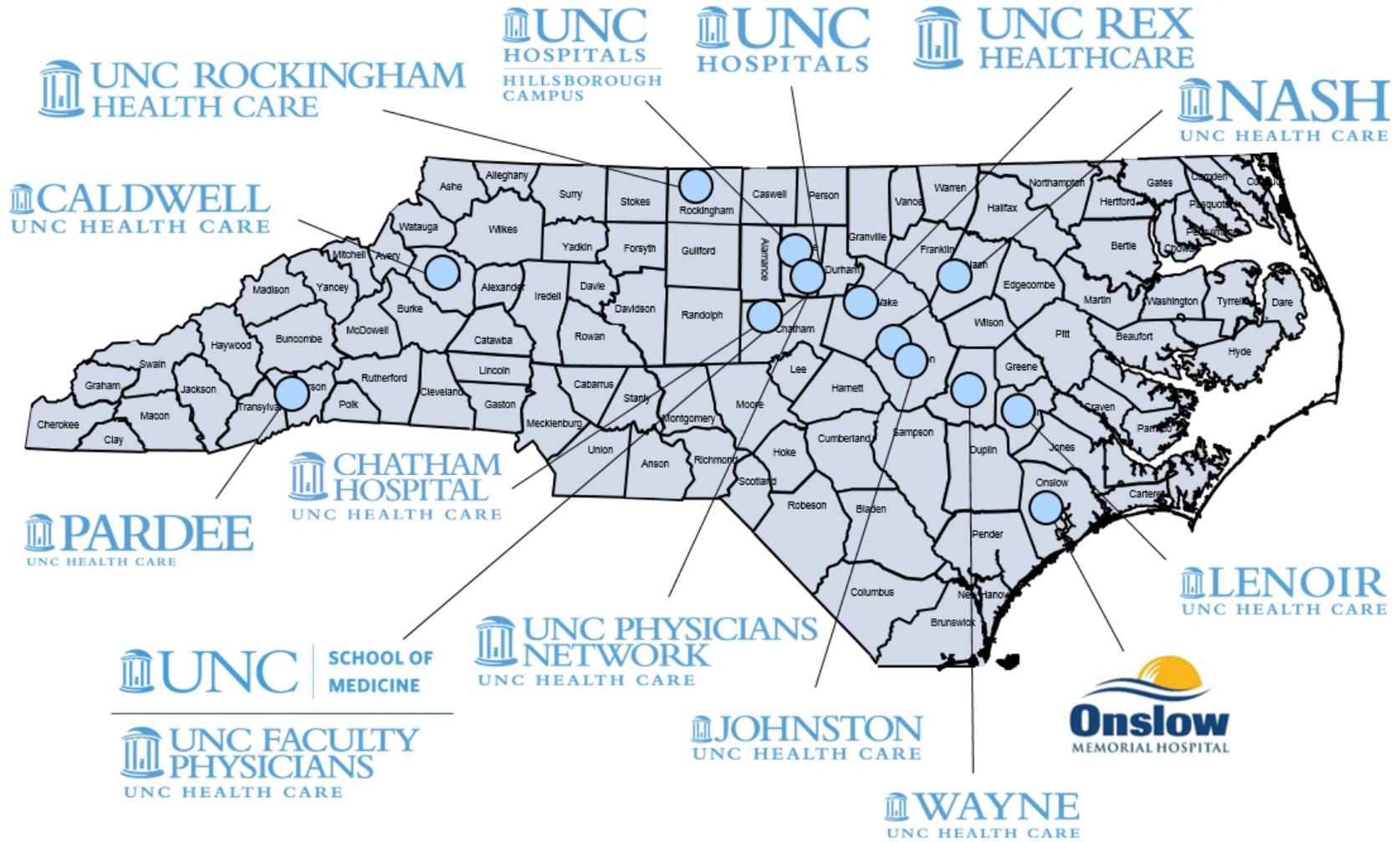


"BEST HOSPITALS IN THE REGION":
 UNC Hospitals
 UNC REX

#1 for Primary Care
 #2 School of Public Health



We serve North Carolina....Every Day



January 1, 2019

Vision of One.... Established in 2012 & grew with UNC Health Care



2013

(January – March)

- Planning and Guiding Principles
- Core Team Assembly and Training
- Subject Matter Expert - SMEs
- Key Decisions

2014 Go-Lives

(April 4th Go-Live 1 and June 20 Go-Live 2)

- 3 Hospitals: UNC Hospitals; Chatham Hospital; Rex Hospital
- and
- All their Physician Groups (Rex, UNCPN, UNC Faculty)

2015 Go-Live

(May and June)

- New Ambulatory Clinics across 3 Hospitals – Caldwell, Johnston, High Point Regional
- EHR Optimization (Improving Existing Build)

2016 Go-Lives

(May and June)

- 4 New Hospitals – Caldwell, Pardee, Johnston, HighPoint Regional
- Cardiology Module – all entities
- Lab Module – all entities

2017 Go-Lives

(Oct – New Modules – all entities)

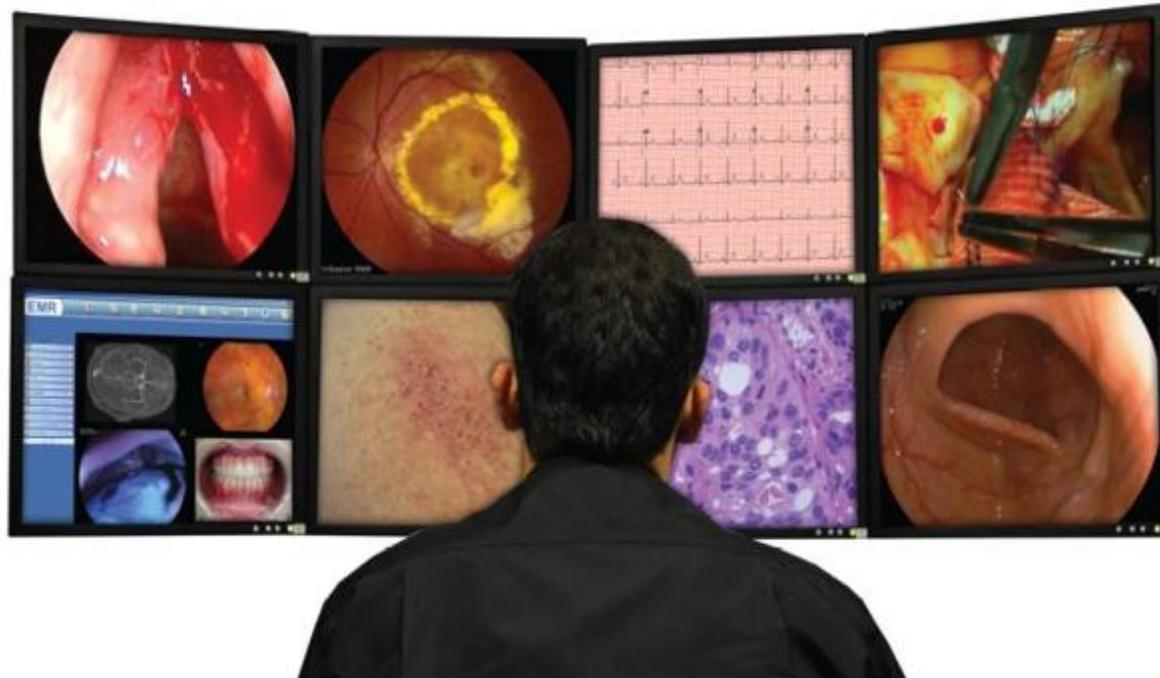
- Case Management
- Infection Control, Antimicrobial Stewardship
- Transfer Center

2018

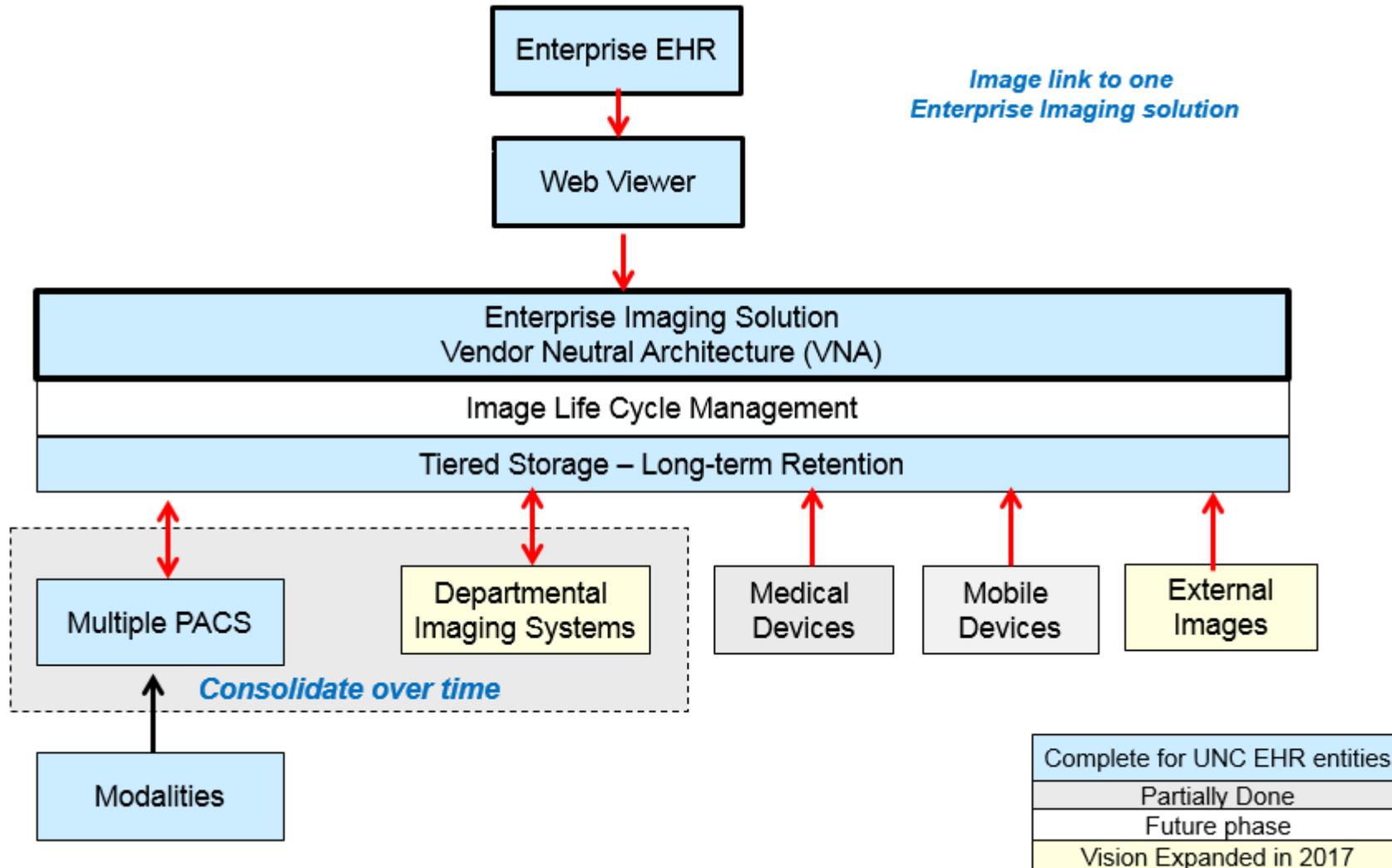
- Homecare and Hospice Module – all entities
- 2 New Hospitals – Nash and Wayne

Vision of One Expanded to include Enterprise Imaging

One patient, One Chart
One Clinical Enterprise Image Repository
integrated with Enterprise EHR
Via One Common Viewer



Enterprise Imaging Model



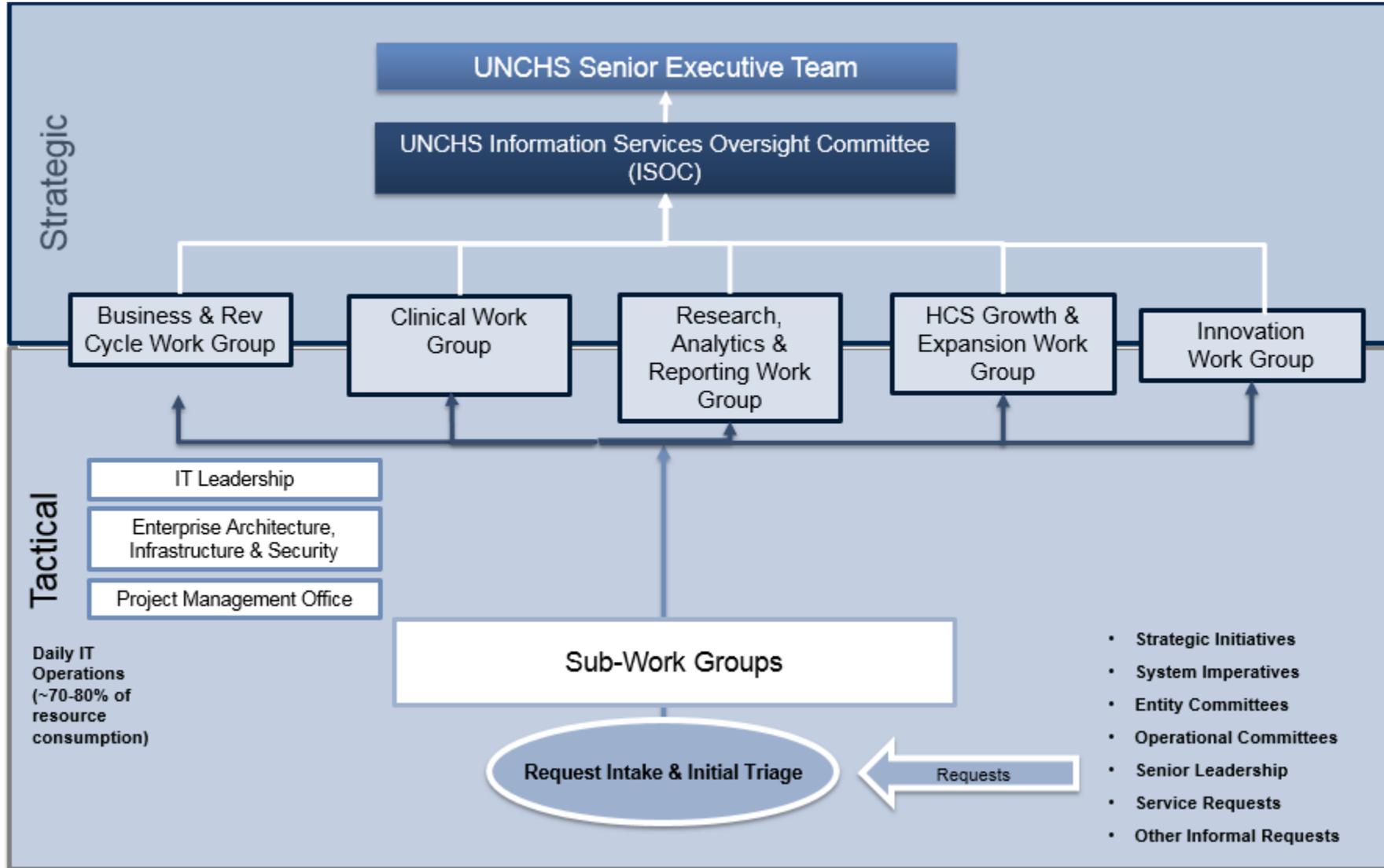
Enterprise Imaging Multi-specialty POC

- Challenges & Opportunities of new frontiers

- Manual Data Entry
- Disparate and siloes of data
 - Visible light
 - POC US
- Manual Data Entry
- Accommodate new workflows
 - Encounter based
 - Ordered based
- Image Integrity and elbow support

Key Success factors

- Governance and Program management



Disclaimers



POCUS **DOES NOT** replace a comprehensive study performed by radiology or cardiology

POCUS answers **YES/NO** questions in real time by the examining provider and can be an extremely effective teaching tool

Point-of-care ultrasound

Focused ultrasonography **performed** and **interpreted** at the patient's bedside by a provider in conjunction with their clinical examination

POCUS is designed to answer specific **yes or no questions** in **real time**:

- Is there a massive pericardial effusion or not?
- Is there blood in the belly or not?
- Is there a pocket of pus to I&D or not?





8 yo male

Shortness of breath

Hemodynamically stable

Ongoing eval for rheum issues





Dx immediately made

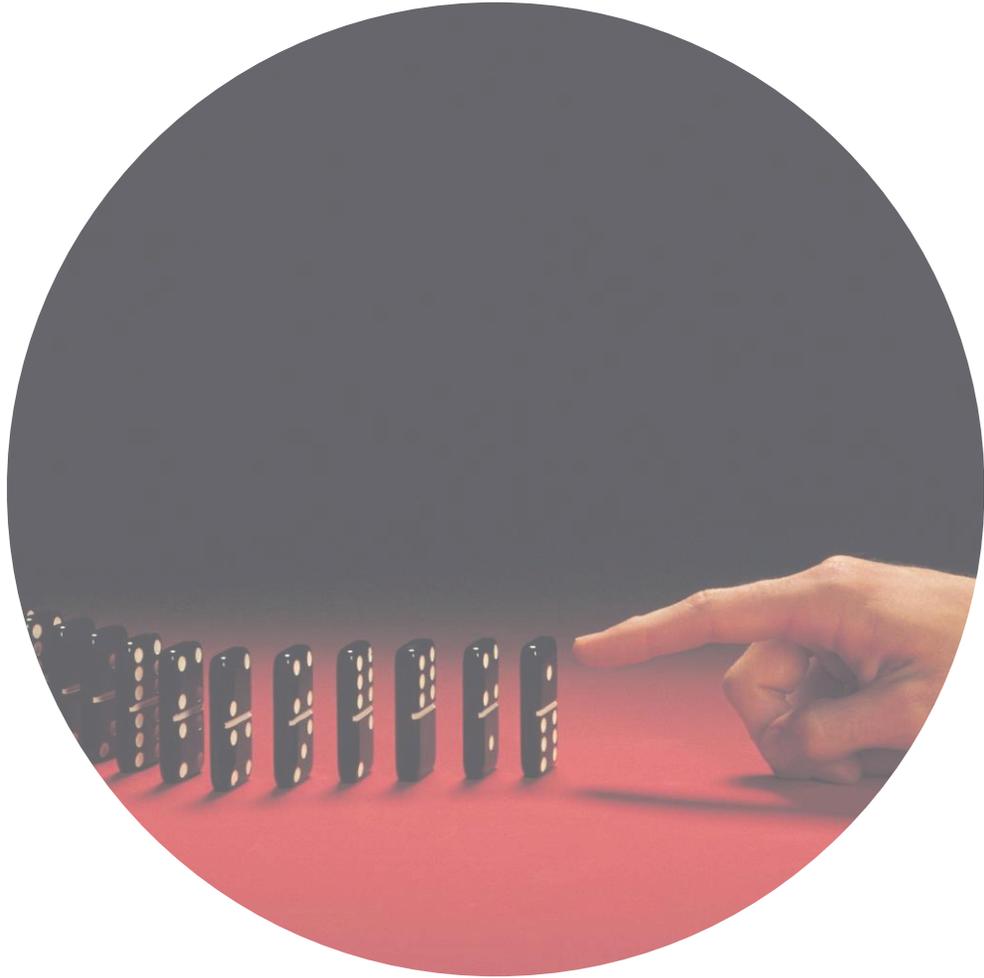
PICU and Cardiology consulted

Fluids

Admitted to PICU

Operative drainage

The Tipping Point



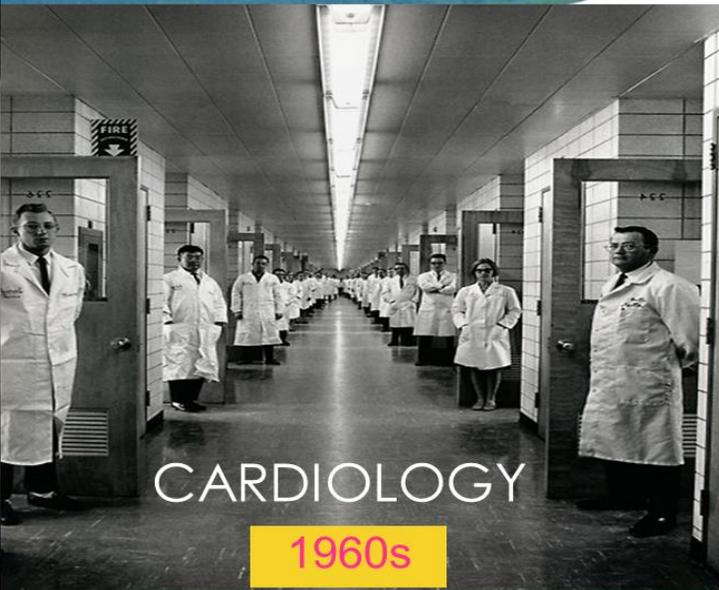
- Becoming part of the **standard of care** across many specialties
- Explosion in the number of **training programs**
- **Rethinking the physical examination and how it's taught**
- Increasing body of **evidence** supporting its use
- **Decreasing barriers to implementation**

Specialty Driven



RADIOLOGY

1950s



CARDIOLOGY

1960s



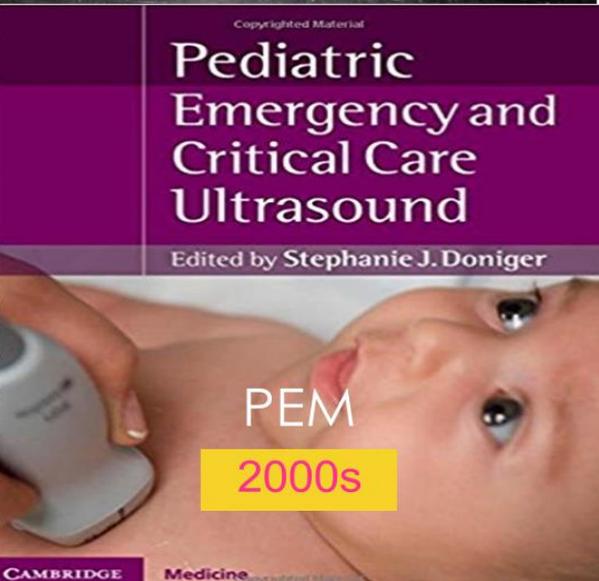
OB

1970s



EM

1990s



Copyrighted Material
**Pediatric
Emergency and
Critical Care
Ultrasound**

Edited by Stephanie J. Doniger

PEM

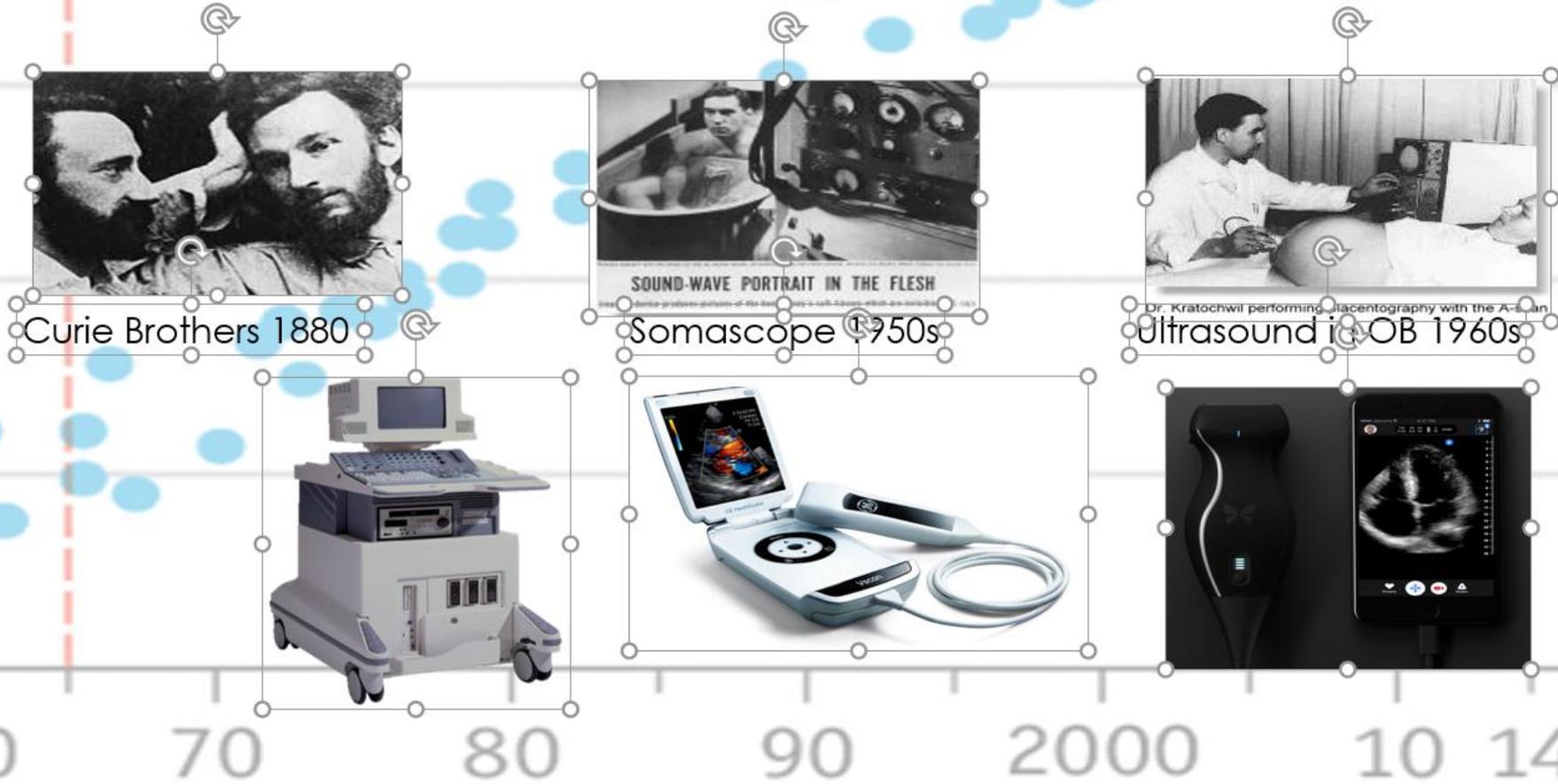
2000s

CAMBRIDGE

Medicine

Ultrasound technology through the years

Ultrasound technology through the years





Philips Lumify



Clarius



GE Vscan

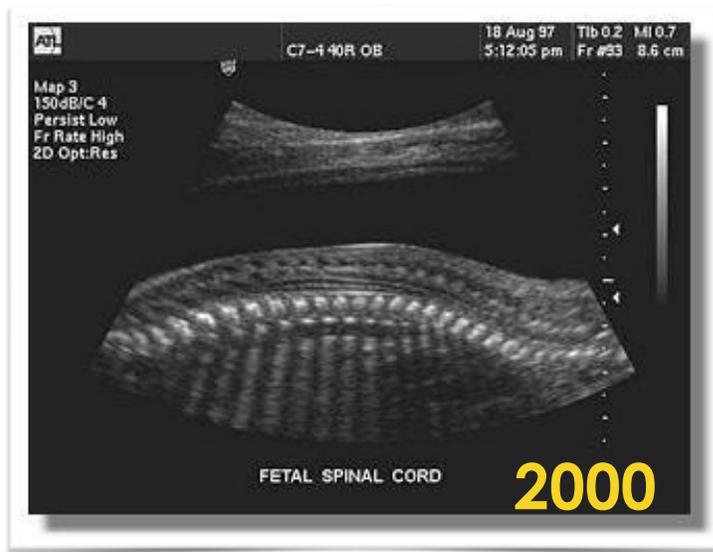
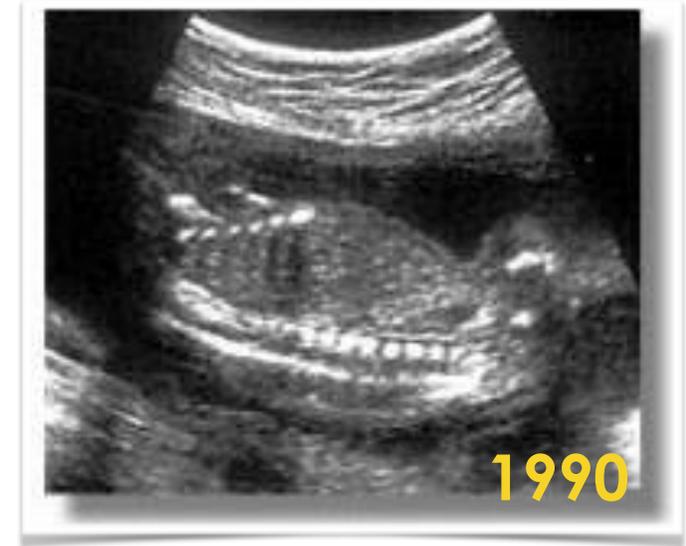
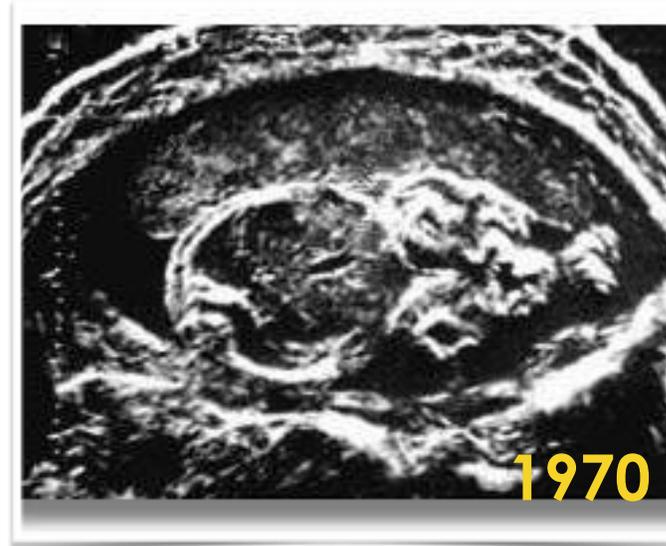
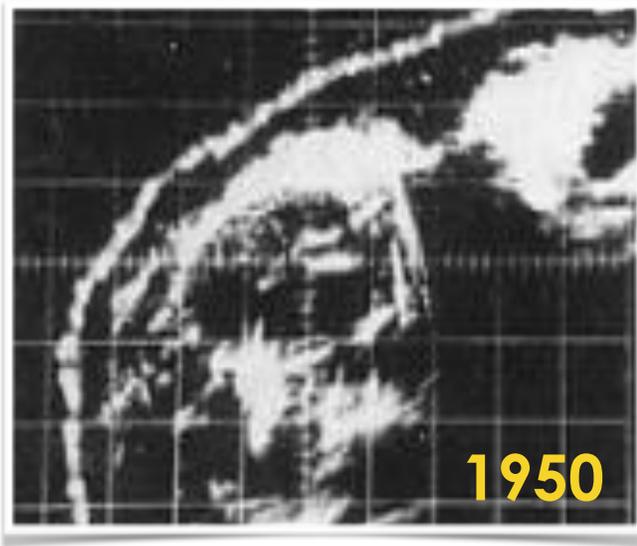


Healcerion SONON



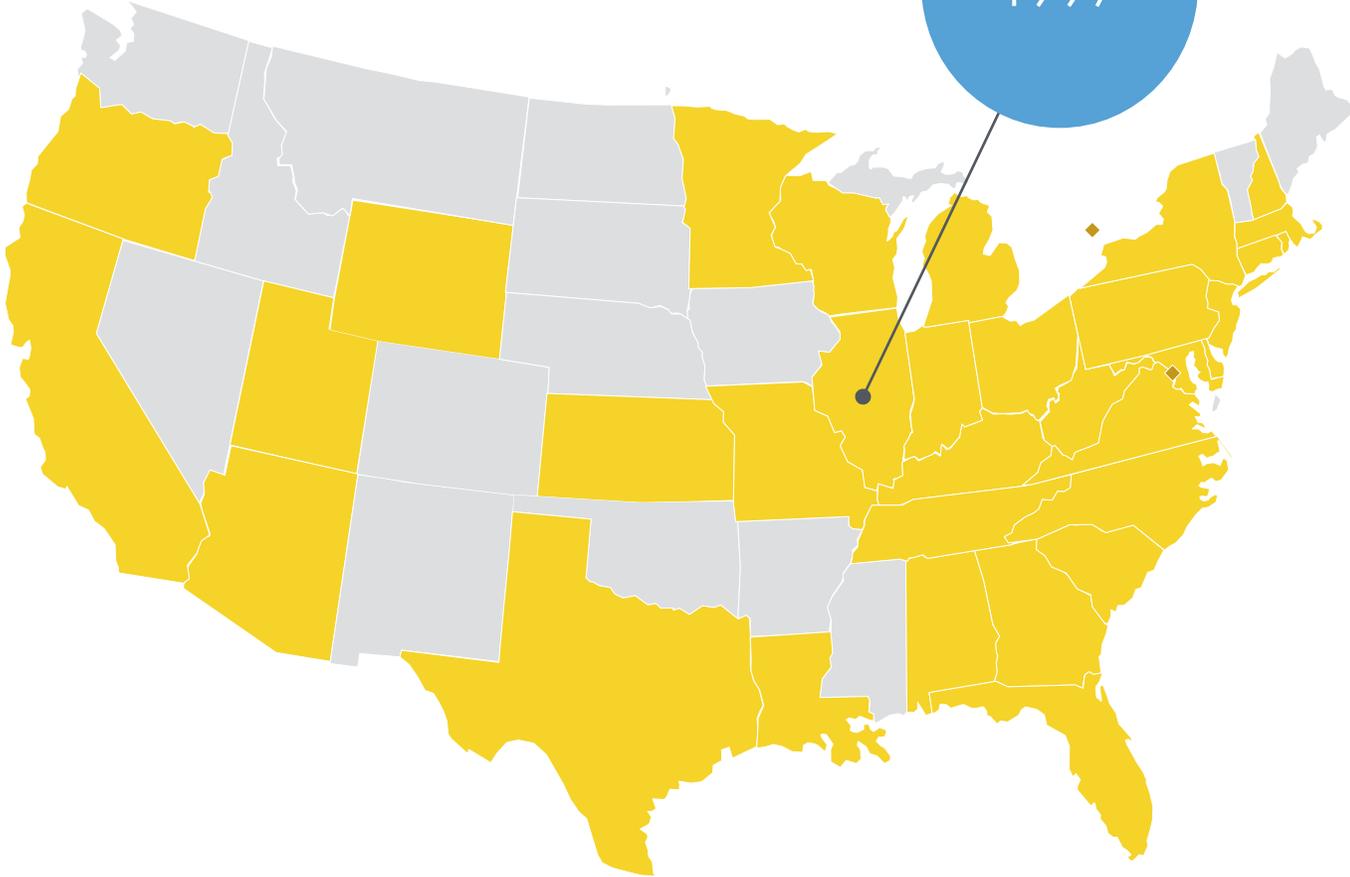
Butterfly Network iQ

Ultrasound technology through the years





1997



100+
Emergency
Medicine
POCUS
Fellowship
Programs



EM PROGRAMS REQUIREMENTS

- ✓ Residents **must** be able to competently perform emergency department bedside ultrasound.
- ✓ Residents **must** use ultrasound for the bedside diagnostic evaluation of emergency medicine conditions and diagnoses, resuscitation of the acutely ill or injured patient, and procedural guidance.

Ultrasound training in newer territory



EMS



**Family
medicine**



**Medical
school**

Rethinking the physical exam

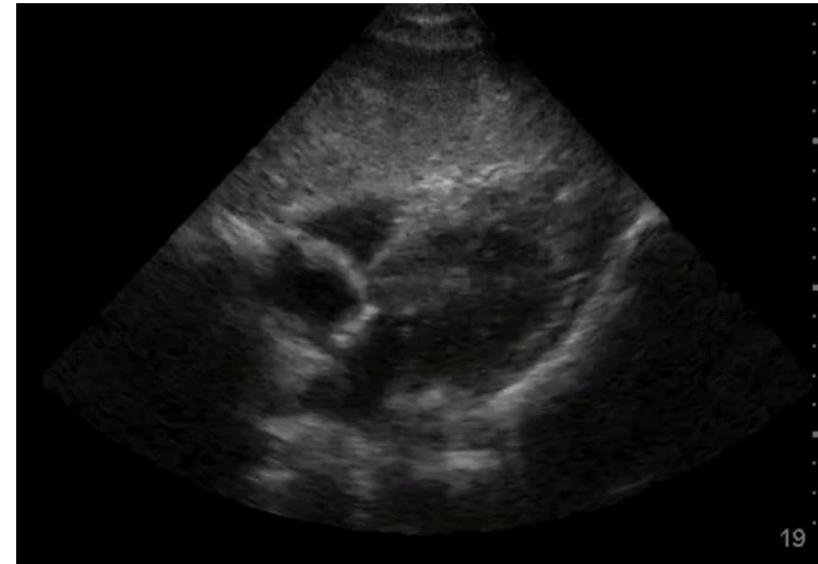
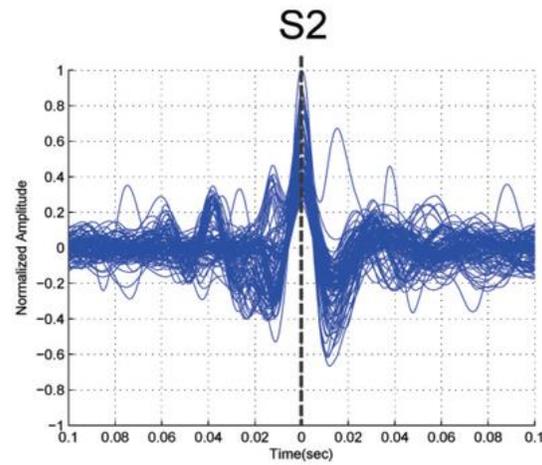
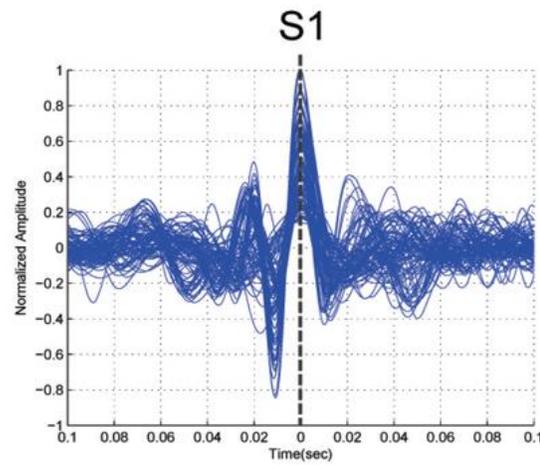
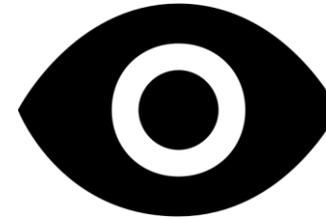


Physical exam taught in medical school **hasn't changed significantly in decades**

Smaller, portable machines make it easier for students to incorporate POCUS throughout curriculum

Capitalizing on medical student **interest**, creation of an **ultrasound electives** at medical schools across the country

Rethinking the physical exam





Notwithstanding its value, I am extremely **doubtful** because its beneficial application requires much **time**, and gives a good deal of **trouble both to the patient and the practitioner.**



...and because its whole hue and character is **foreign** and **opposed to our habits** and associations.

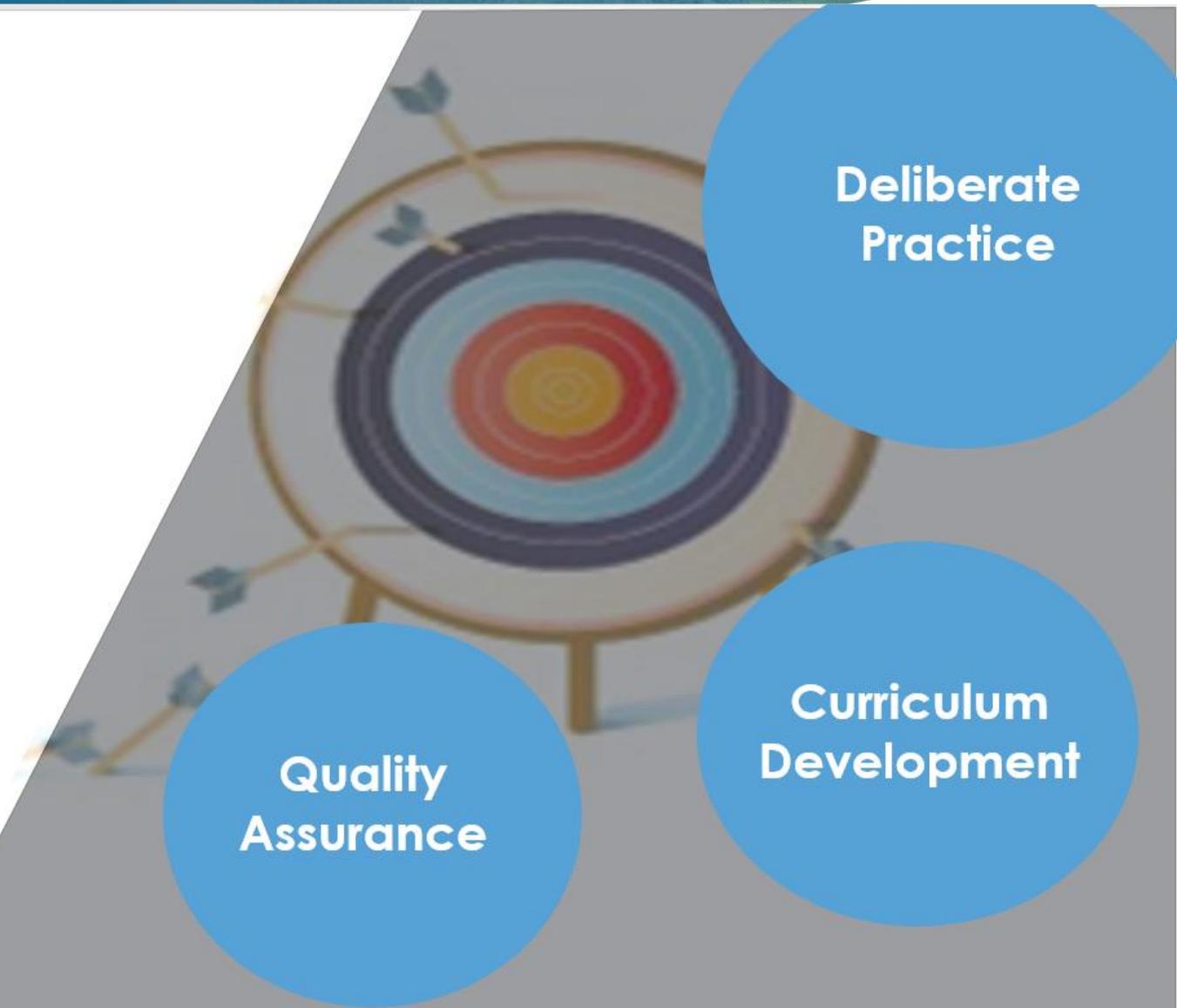
—Sir John Forbes **1821**

preface to Laennec's *De L'Auscultation Mediate* on the **stethoscope**

POCUS is a **skill** that combines real time **image acquisition, interpretation, and action**



How to become an expert?

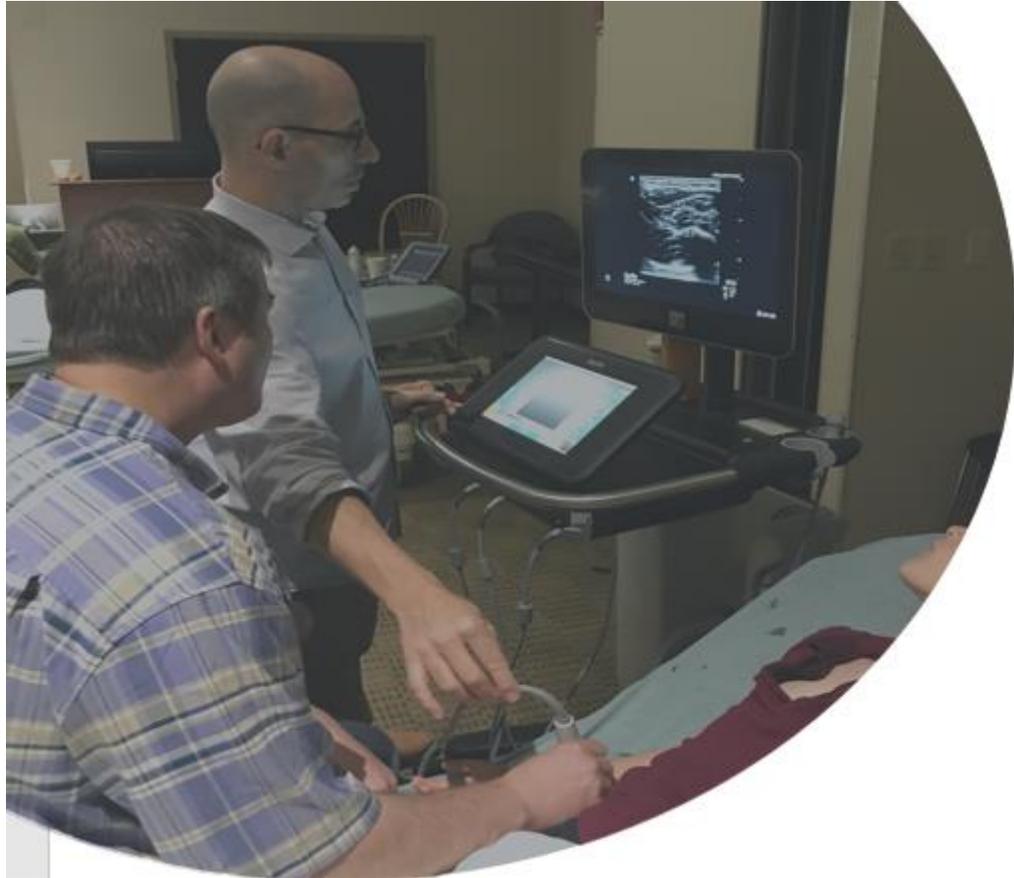


Deliberate Practice

Quality Assurance

Curriculum Development

Quality Assurance



Deliberate practice is worthless without **feedback**

Spending time with coaches/instructors to perform **image review** is essential

Practice and feedback model is effective but extremely **time intensive** for both learners and instructors

Interface with Information Technology



- POCUS images need to be **easily accessed** in the EMR by all providers
- Clinical management, quality assurance, and billing implications
- **Real time POCUS image transfer may transform all aspects of care (prehospital to ICU and everywhere in between)**

Orders

Quick List

All Orders Active Results Signed & Held Home Meds Order History

ED Quick List

POCUS

Trauma

US FAST PROTOCOL EMERGENCY

Cardiovascular

US Aorta

US Venous Doppler Lower Extremity Bilateral

US Venous Doppler Lower Extremity Left

US Venous Doppler Lower Extremity Right

Soft Tissue/Musculoskeletal

US Extremity Nonvasc LTD (Joint, Muscle, Tendon, Ligament) Bilateral

US Extremity Nonvasc LTD (Effusion, Mass, Fluid) Left

US Extremity Nonvasc LTD (Effusion, Mass, Fluid) Right

US Soft Tissue Head And Neck

Genitourinary

US Renal (Limited)

US Urinary Bladder Only

Obstetrical

US OB Limited Any Tri (Placenta Or AFI Or Hrt Tone Or Pos)

US OB Transvaginal

Procedural

US Arthrocentesis Intermediate Joint W U

US Arthrocentesis Large Joint W US Guide

US Arthrocentesis Small Joint W US Guide

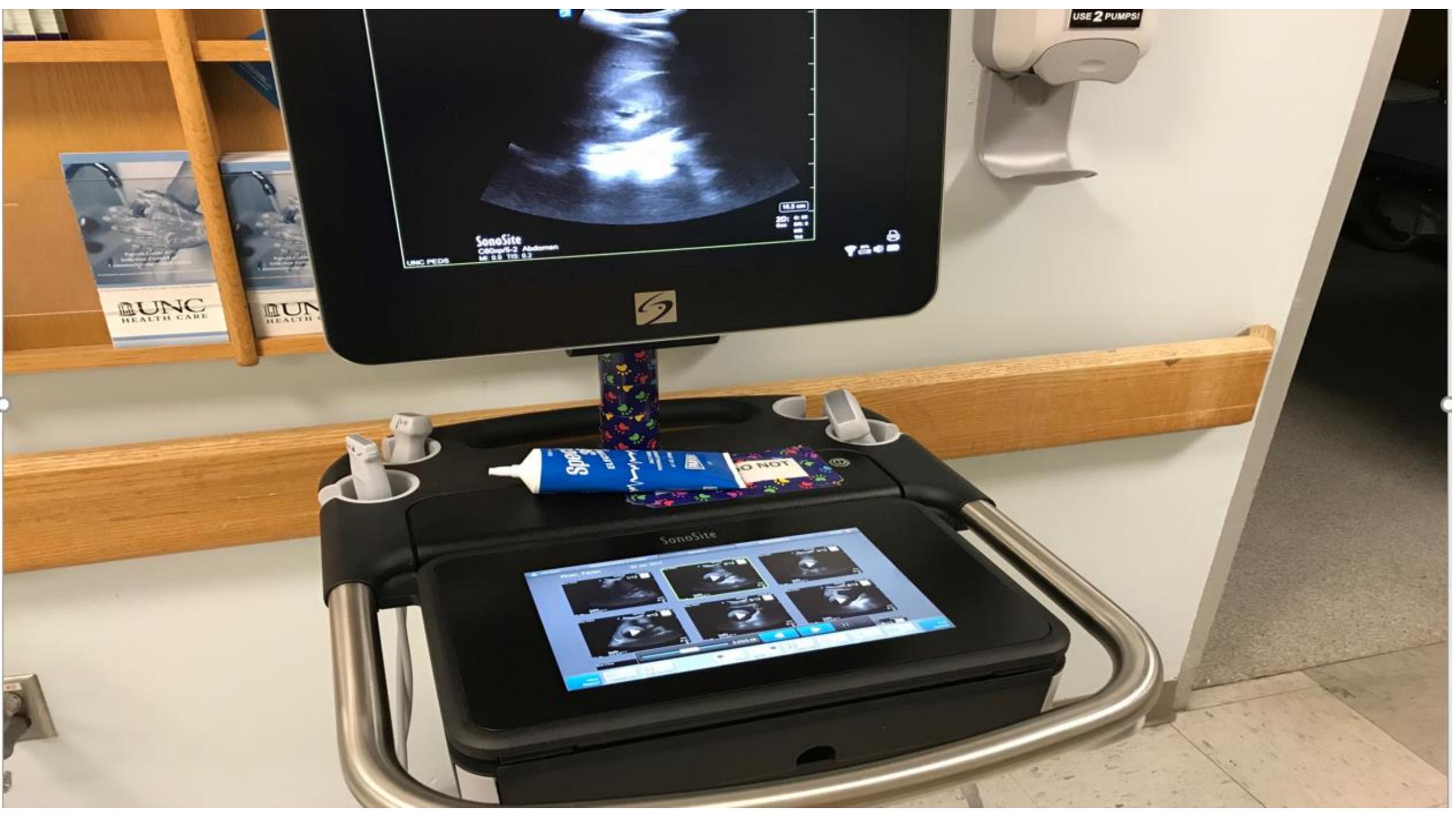
US Cyst Aspiration Guidance

IR Vascular Access (US Guidance)

Other

US Chest Bilateral

US Abdomen Limited



SonoSite
C80-16-2 Abdomen
M: 0.0 TD: 0.2

UNC PEDS



USE 2 PUMPS!



SonoSite



Limited Focused Assessment with Sonography for Trauma (FAST) Ultrasound (CPT: (chest))

Indication:

A focused ultrasound exam of the peritoneal space (including the following areas sub-phrenic, retro-vesicular), pericardial space, and pleural spaces was performed to evaluate for free fluid indications, as noted in the H&P: {EDPOCUS FAST INDICATIONS:48407}

Identified structures:

The heart, diaphragms, liver, spleen, kidneys, and bladder were identified and

Findings:

Exam of the above structures revealed the following findings in the peritoneal

Evaluation for free fluid in:

Morison's pouch: {EDPOCUS FAST RUQ:48408}

Splenorenal fossa: {EDPOCUS FAST LUQ:48409}

Retrovesicular space: {EDPOCUS FAST SP:48410}

Pericardial space: {EDPOCUS FAST CARDIAC:48411}

Evidence of pericardial tamponade: {EDPOCUS FAST TAMPONADE:48412}

Pleural space: {EDPOCUS FAST LUNG:48413}

If pleural fluid is present, which side: {EDPOCUS FAST LUNG SIDE:48414}

blunt abdominal
penetrating abdo
abdominal pain
chest pain
hypotension
tachycardia
dyspnea
other indications

pt out: **Yes /...** Value Car... Infection:... **Allergies: Lentil...** Loc: UNC ED-... Code Not on file Team: INS: UNITED H... BMI: 25.10 kg/m² Weight: 81.6 kg...
 ch: None FYI: None Lang:: EN... Isolation: None Critical Airway? : N... 2nd INS: OPTU... Height: 180.3 c...

view

Encounters **Imaging** Labs Cardiology Episodes Letters Media Meds Misc/MyChart Other Orders Procedures Referrals Snapshot

8:59 AM) Route Review Selected Preview More Select All Deselect All

Hide Canceled CT CV Echo Fluoro IR Mammo MRI NM US X-ray

Ordered	End Exam	Exam
Today	07/24/2017 0223	XR Hand 3 Or More Views Right
Today	07/24/2017 0115	US FAST PROTOCOL EMERGENCY

← ↻ 🏠 🖨️ [Icons] X

US FAST PROTOCOL EMERGENCY

Status: Final result

PACS Images

[Show images for US FAST PROTOCOL EMERGENCY](#)

US FAST PROTOCOL EMERGENCY

Order: 1303413237

Status: Final result Visible to patient: No (Not Released) Next appt: None

Details

Reading Physician	Reading Date	Result Priority
Daniel Boram Park, MD	7/24/2017	STAT

Narrative & Impression

Limited Focused Assessment with Sonography for Trauma (FAST) Ultrasound (CPT: 76705-26 (abdomen) + 93308-26 (cardiac) + 76604-26 (chest))

Indication:

A focused ultrasound exam of the peritoneal space (including the following areas sub-phrenic, Morison's pouch, splenorenal, superior colic gutters, and retro-vesicular), pericardial space, and pleural spaces was performed to evaluate for free fluid. The ultrasound was performed with the following indications, as noted in the H&P: other indications as noted in the H&P

Identified structures:

The heart, diaphragms, liver, spleen, kidneys, and bladder were identified and the spaces noted above were examined.

m Relate Link Annotations Titles Full Quality Reset Prev. Hang. Prot. Next Study Layout View Cine Help Logoff

XR ANKLE
 SR CR
 3
 Jul 16 Jul 16 2009

Compressed

24 Jul 2017 / 01:37

NA
 17
 RASOUND -UN
 46 AM
 ate 30 Hz

UN
 SonoSite, Inc.



16.2 cm

SonoSite
 C60xp/5-2 Abdomen
 MI: 0.9 TIS: 0.2

2D: G: 69
 Gen DR: 0
 MB
 THI

Status Report: UNCCMC ED POCUS (Not Reviewed), Total Count: 103, Patients: 103

 Refresh
  Views
  Study Review
  App Desk
  Study Details
  Reviewed
  IB Message
  Mark for Correction

Reviewed	Accession #	Patient	Study Status	Procedure	Prelim Provider	Finalizing Physician	Marked	Correction Comment
			Exam Ended	ED POCUS FAST Protocol Emergency				
			Prelim	ED POCUS FAST Protocol Emergency	FISHER, JOSEPH H [95354]			
			Final	ED POCUS Right Upper Quadrant	MCGARRY, MICHAEL J [95351]	BINZ, NIKKI MARIE		
			Final	ED POCUS Renal (Limited)	HINES, CORY M [87535]	BURKE, GARY FRANCIS		
			Final	ED POCUS Extremity Nonvasc LTD (Effusion, Mass, Fluid) Left	TEETER, WILLIAM A [87539]	BURKE, GARY FRANCIS		
			Final	ED POCUS Extremity Nonvasc LTD (Effusion, Mass, Fluid) Right	FISHER, JOSEPH H [95354]	DAVENPORT, KATHLEEN T		
			Final	ED POCUS Extremity Nonvasc LTD (Effusion, Mass, Fluid) Right	FISHER, JOSEPH H [95354]	DAVENPORT, KATHLEEN T		
			Final	ED POCUS Aorta	JULICH, BRIAN N [15039]	DAVENPORT, KATHLEEN T		
			Final	ED POCUS Chest Bilateral	FISHER, JOSEPH H [95354]	DAVENPORT, KATHLEEN T		
			Final	ED POCUS Chest Bilateral	DESELM, TRACY MARTIN [1297]	DESELM, TRACY MARTIN		
			Final	ED POCUS RUSH Protocol Emergency	FENDER, KIMBERLY M [95419]	GOLIKE, ERIC SCOTT		
			Final	ED POCUS FAST Protocol Emergency		GROVER, JOSEPH MARCUS		
			Final	ED POCUS RUSH Protocol Emergency	HARRIGAN, MICHAEL [1563]	HOWARTH, CHRISTOPHER LEO		
			Final	ED POCUS Right Upper Quadrant	MCCOY, MARSHALL CLARKE [1963]	HOWARTH, CHRISTOPHER LEO		
			Final	ED POCUS RUSH Protocol Emergency	MOSHER, WILLIAM P [103044]	MIGLIACCIO, DANIEL JAMES		
			Final	ED POCUS FAST Protocol Emergency	TEETER, WILLIAM A [87539]	MIGLIACCIO, DANIEL JAMES		
			Final	ED POCUS Extremity Nonvasc LTD (Effusion, Mass, Fluid) Right	MOSHER, WILLIAM P [103044]	MIGLIACCIO, DANIEL JAMES		
			Final	ED POCUS RUSH Protocol Emergency	HADLEY, KRISTIE M [91440] HADLEY, KRISTIE M [91440] HADLEY, KRISTIE M [91440]	MIGLIACCIO, DANIEL JAMES		
			Final	ED POCUS Cyst Aspiration Guidance	GRIMALDI, KYLE F [95373]	MIGLIACCIO, DANIEL JAMES		
			Final	ED POCUS RUSH Protocol Emergency	TEETER, WILLIAM A [87539]	MIGLIACCIO, DANIEL JAMES		
			Final	ED POCUS Extremity Nonvasc LTD (Effusion, Mass, Fluid) Right	FISHER, JOSEPH H [95354]	MIGLIACCIO, DANIEL JAMES		
			Final	ED POCUS Right Upper Quadrant	TEETER, WILLIAM A [87539]	MIGLIACCIO, DANIEL JAMES		

Limited Cardiac Ultrasound (CPT 93308-26)**Indication:**

A focused ultrasound exam of the heart was performed to evaluate for pericardial effusion, tamponade, severe hypovolemia, or gross abnormalities of cardiac anatomy or function in this patient. The ultrasound was performed

Identified structures:

The pericardial sac, myocardium, and 4 chambers were identified using the following views: subxiphoid

Findings:

Exam of the above structures revealed the following findings:

Pericardial effusion: Present with a SMALL effusion

Global LV function: Reduced

Right ventricular size: Dilated

Signs of RV strain: N/A

Limitations: None.

Impression:

Global ventricular function: Reduced

Interpreted by: William A Teeter, MD

Quality Assurance

After review of the point-of-care ultrasound performed in this case I assess the overall image quality as: Image quality: Minimal criteria met for diagnosis, all structures imaged well and diagnosis easily supported

The accuracy of interpretation of images as presented reflects a true positive.

This study does meet minimum criteria for credentialing and billing.

Daniel J Migliaccio, MD



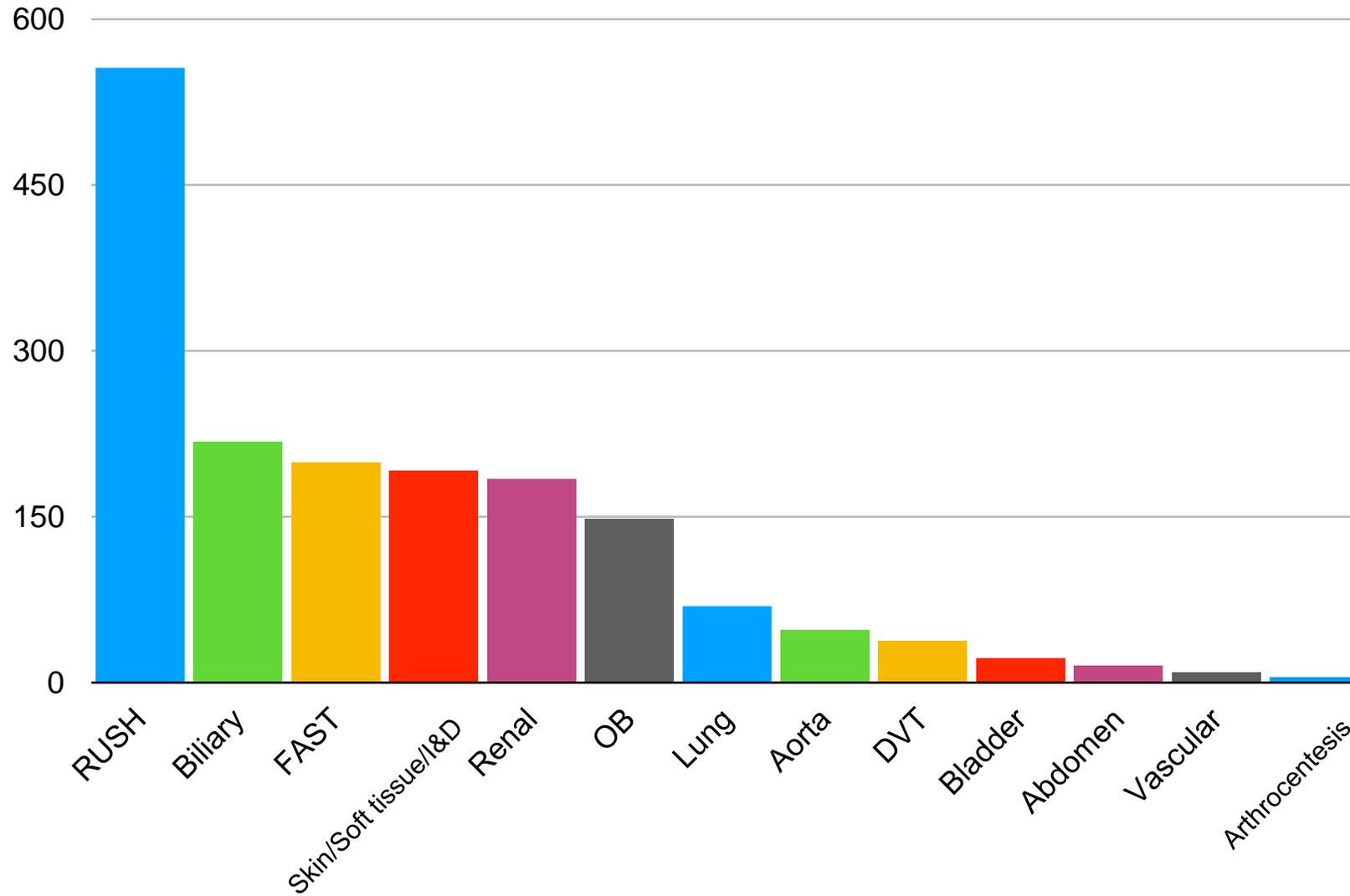
**UNC EMERGENCY
ULTRASOUND**

RESIDENT POCUS REPORT CARD

JULY 2017-NOVEMBER 2018

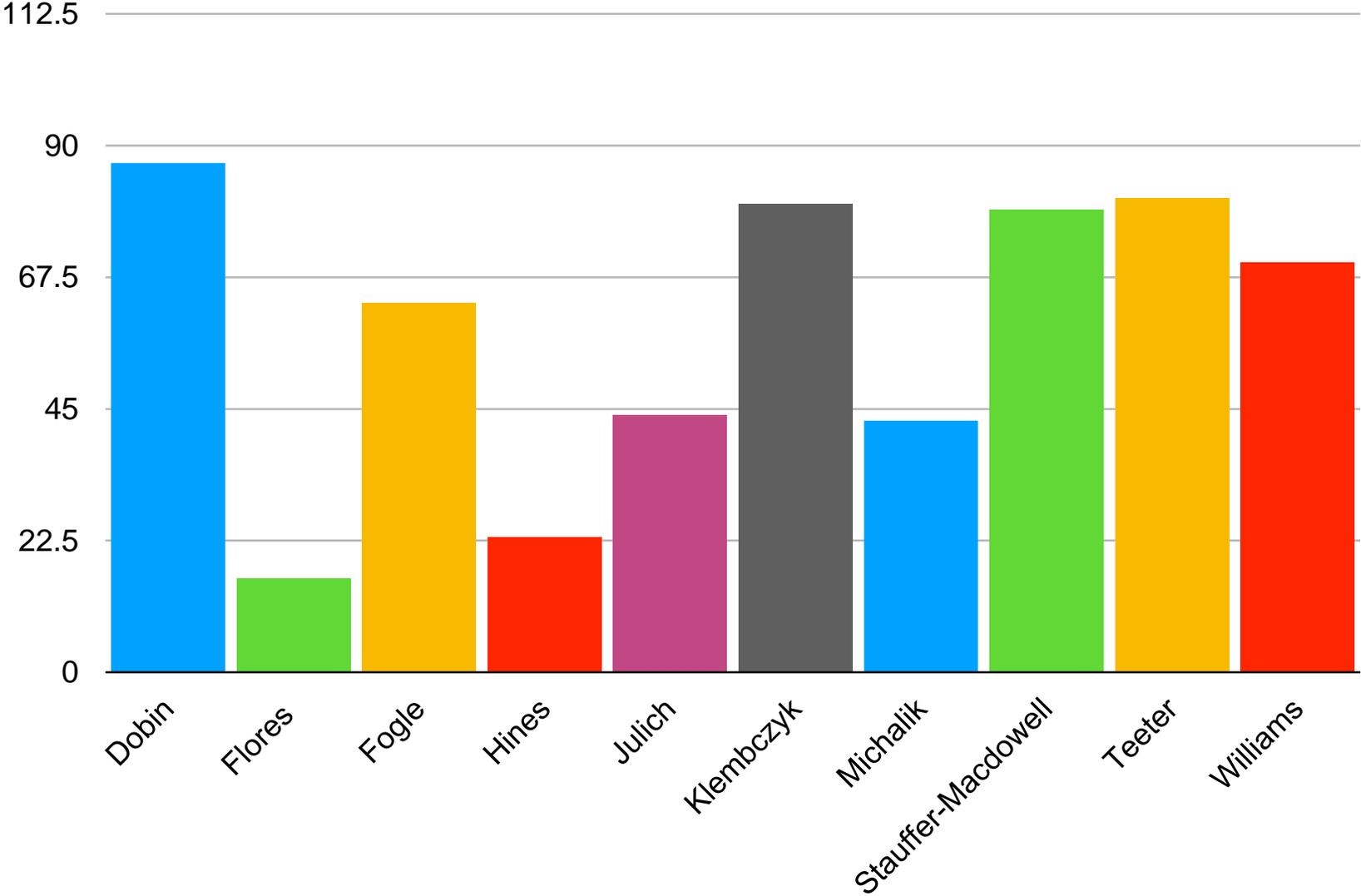


WHAT RESIDENTS ARE SCANNING JUL 2017- Nov 2018

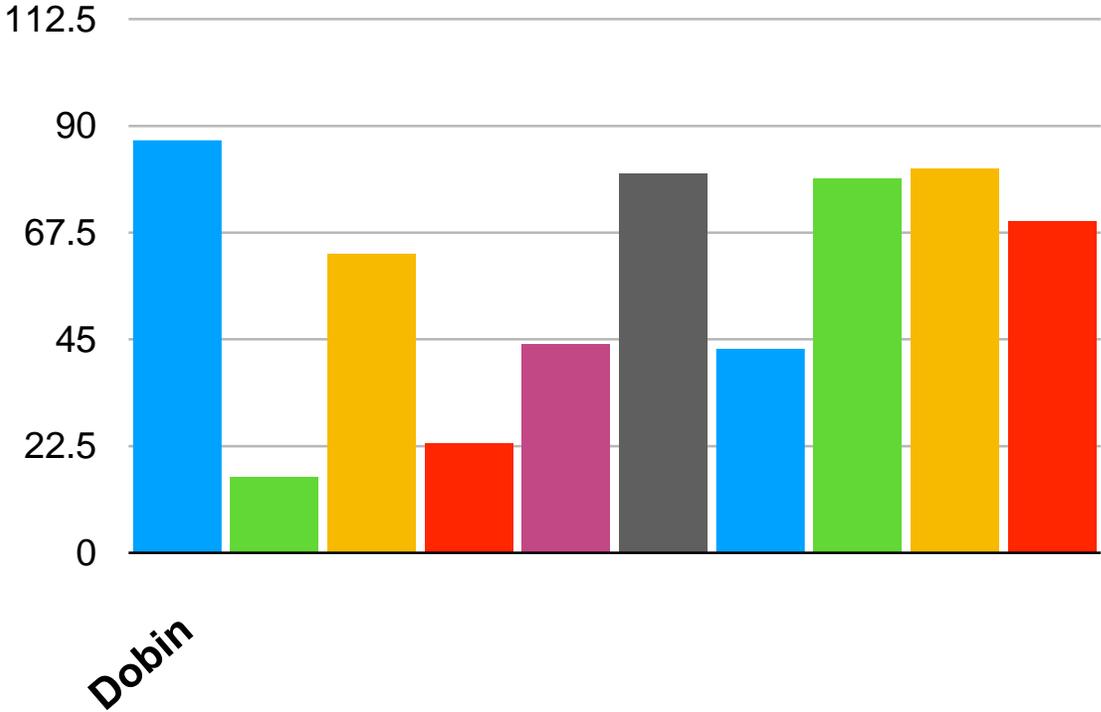


PGY 3 TOTAL APPROVED POCUS SCANS

Jul 2017-Nov 2018



Dobin POCUS 2017-2018



MODALITY	RESIDENT	NUMERATOR	DENOMINATOR	PERCENTAGE
ED POCUS Aorta	DOBIN, JONATHAN J.	2	2	100.0%
ED POCUS Arthrocentesis - Knee	DOBIN, JONATHAN J.	1	1	100.0%
ED POCUS Chest Bilateral	DOBIN, JONATHAN J.	2	2	100.0%
ED POCUS Cyst Aspiration Guidance	DOBIN, JONATHAN J.	5	5	100.0%
ED POCUS Extremity Nonvasc LTD (Effusion, Mass, Fluid) Right	DOBIN, JONATHAN J.	1	1	100.0%
ED POCUS FAST Protocol Emergency	DOBIN, JONATHAN J.	6	6	100.0%
ED POCUS OB Ultrasound	DOBIN, JONATHAN J.	2	2	100.0%
ED POCUS Renal (Limited)	DOBIN, JONATHAN J.	6	6	100.0%
ED POCUS Right Upper Quadrant	DOBIN, JONATHAN J.	15	17	88.2%
ED POCUS RUSH Protocol Emergency	DOBIN, JONATHAN J.	42	46	91.3%
ED POCUS Soft Tissue Head And Neck	DOBIN, JONATHAN J.	3	3	100.0%
ED POCUS Venous Doppler Lower Extremity Bilateral	DOBIN, JONATHAN J.	0	1	0.0%
ED POCUS Venous Doppler Lower Extremity Left	DOBIN, JONATHAN J.	2	2	100.0%

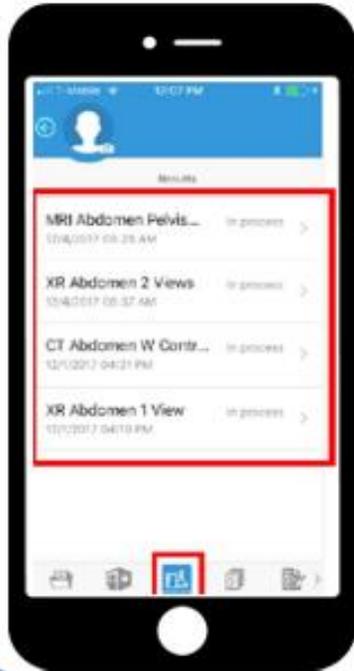
Fiscal Impact of POCUS Billing

- Single-center retrospective study of a novel POCUS billing protocol at an academic medical center
- **5X increase in POCUS exams billed**
- **45% increase in ED faculty participation in pocus billing**
- Within 1 year significant revenue generated
~\$350,000 net profit

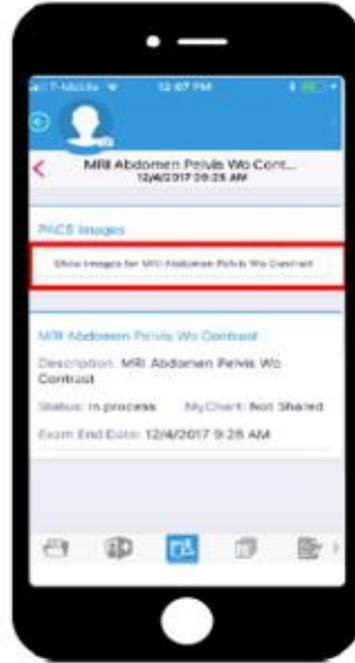
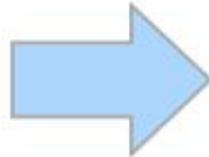
Next Steps for POCUS in the ED UNC

- Continue to fine-tune/add to our Smartphrases for POCUS studies
- Leverage data and billing information to secure funding for the POCUS program: faculty expertise, educational development, research, and more ultrasound machines
- Incorporate Butterfly IQ (new, smaller, portable ultrasound machines) into existing POCUS infrastructure

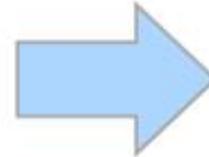
Image review is also available on Mobile Devices



1 Go to Reports Activity. Tap on any imaging related procedure

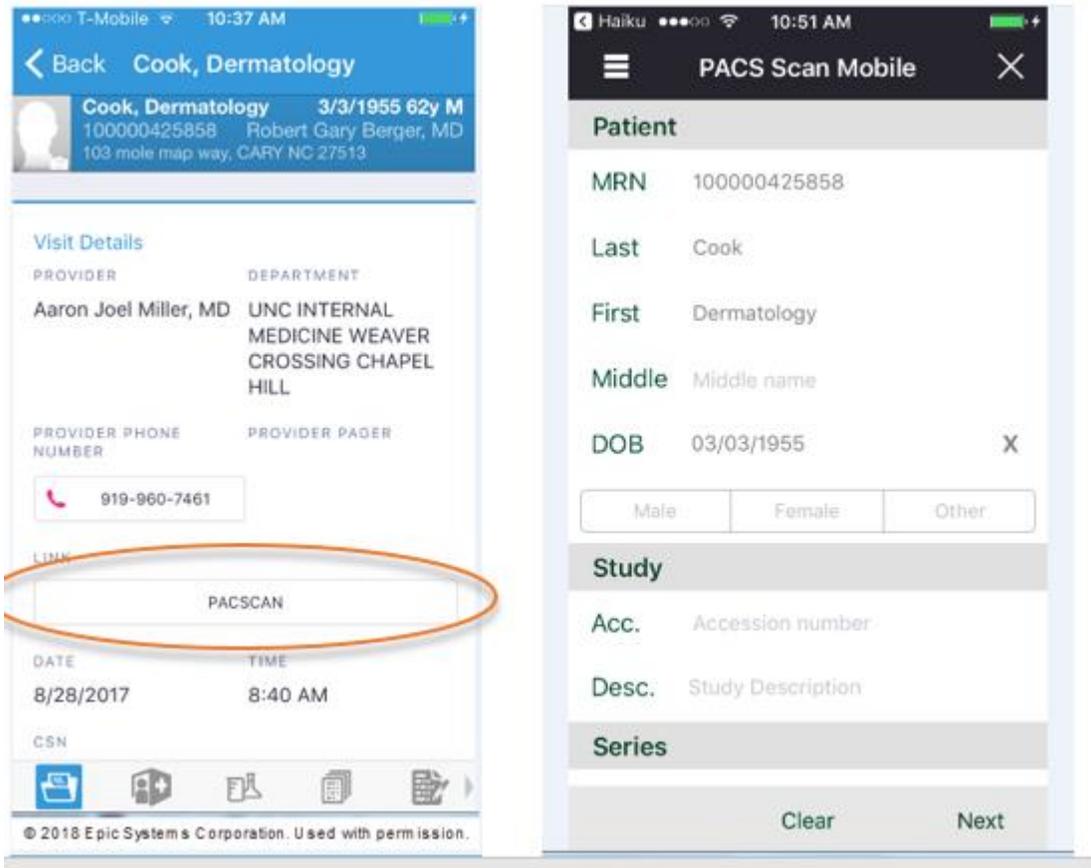


2 Tap the button under "PACS Images" to view



3 NilRead viewer opens to display image via browser.

Visual Light Imaging acquisition is now Mobile

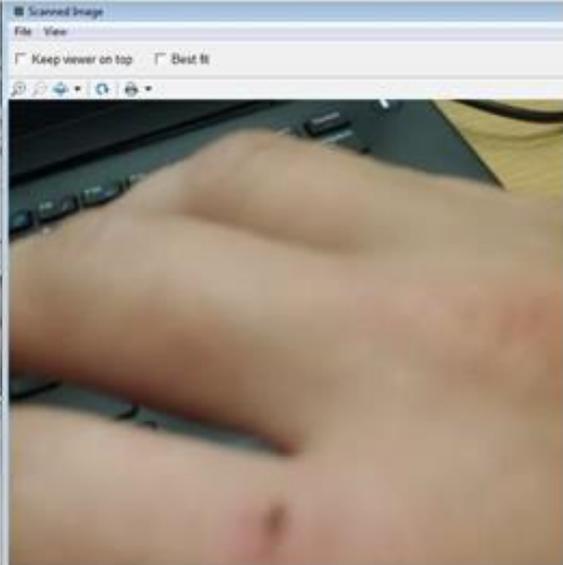


Bringing the best in technology imaging tools to visual light

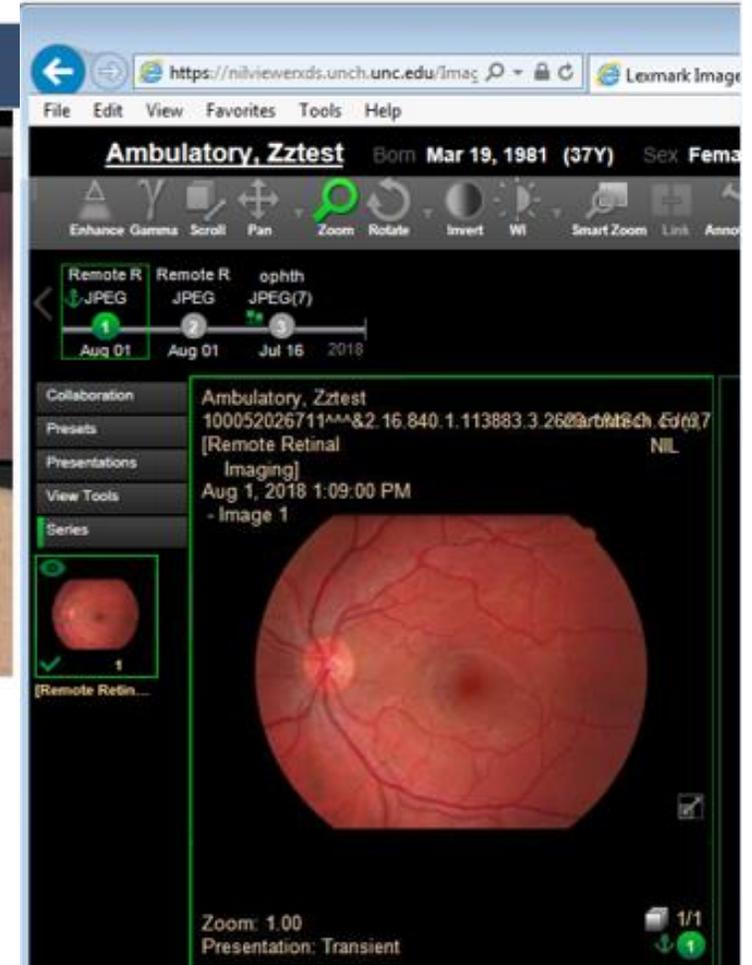
- The revolution continues across the medical imaging continuum

Standalone web-based tools offer flexibility for various use cases including restricted photos

Traditional Viewer in EMR



Enterprise Clinical Image Viewer



Summary



Supports the One Patient One Chart Vision



Tighter Clinical Integration & better continuity of care

Examples:

- Timely access to images across enterprise facilitates time-sensitive consults with rest of UNC Health Care System
 - Reduction in repeat imaging tests
-



Operational Efficiencies and Compliance

Reduction in annual support and enhancement costs; Fewer upgrades; and More efficient support models



Architecture Simplification

Fewer interfaces; Fewer server and application foot prints; Focus now on business continuity planning