THE DICOM 2013 INTERNATIONAL CONFERENCE & SEMINAR
March 14-16 Bangalore, India

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Digital Imaging and Communications in Medicine

Tele ICU in India

INTELEICU
Powering Critical Care

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Outline

- 1. Who is an intensivist?
- 2. Why is there a need for a teleICU solution in India?
- 3. How does teleICU work?
- 4. The challenge of teleICU in the Indian Scenario

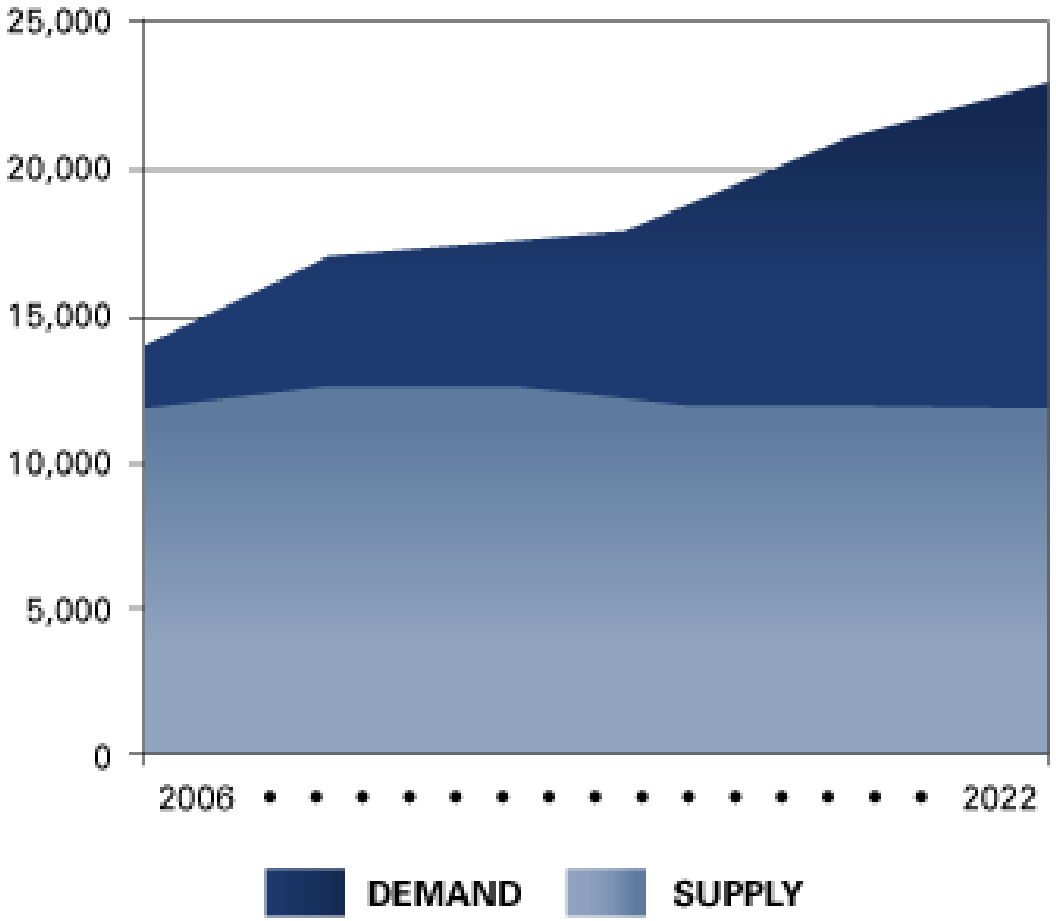
Who is an intensivist?

- A specialist who is trained in monitoring and management of critically ill patient
- Intensivists can have a background of medicine, anesthesia, pulmonology or rarely even surgery or cardiology
- Works to keep patients alive by providing support to organ systems
- Critical Care is a relatively new field but demand has increased so much in the last few years that it greatly outstrips the supply of trained intensivists

Background

- Mortality rates in ICU are very high - typically 10-20%
- About 200,000 patients die in ICUs in USA every year
- LEAPFROG group recommendations-Mortality rates are significantly lower in hospitals with ICUs managed exclusively by board-certified intensivists
- Research has shown that in ICUs where intensivists manage or co-manage all patients versus low intensity there is a 30% reduction in hospital mortality and a 40% reduction in ICU mortality.
- Data suggests that over 54,133 deaths that occur in the ICU could be avoided if The Leapfrog Group IPS Safety Standard were implemented in all urban hospitals with ICUs across the US

Intensivists Supply/Demand 2006 - 2022



Committee on Manpower for Pulmonary and Critical Care Societies (COMPACCS) JAMA.2000

Indian scenario

- 70,000 ICU beds available including all types and across all hospitals and small time nursing homes in India that cater to five million patients requiring ICU admission every year
- Almost 80 per cent of investment will have to come from the for-profit private and charitable sector where Critical Care accounts for 20 to 30 per cent of a hospital's budget
- Upto 50% of ICU costs may go for hiring trained professionals (in western studies)

Health Care Scenario

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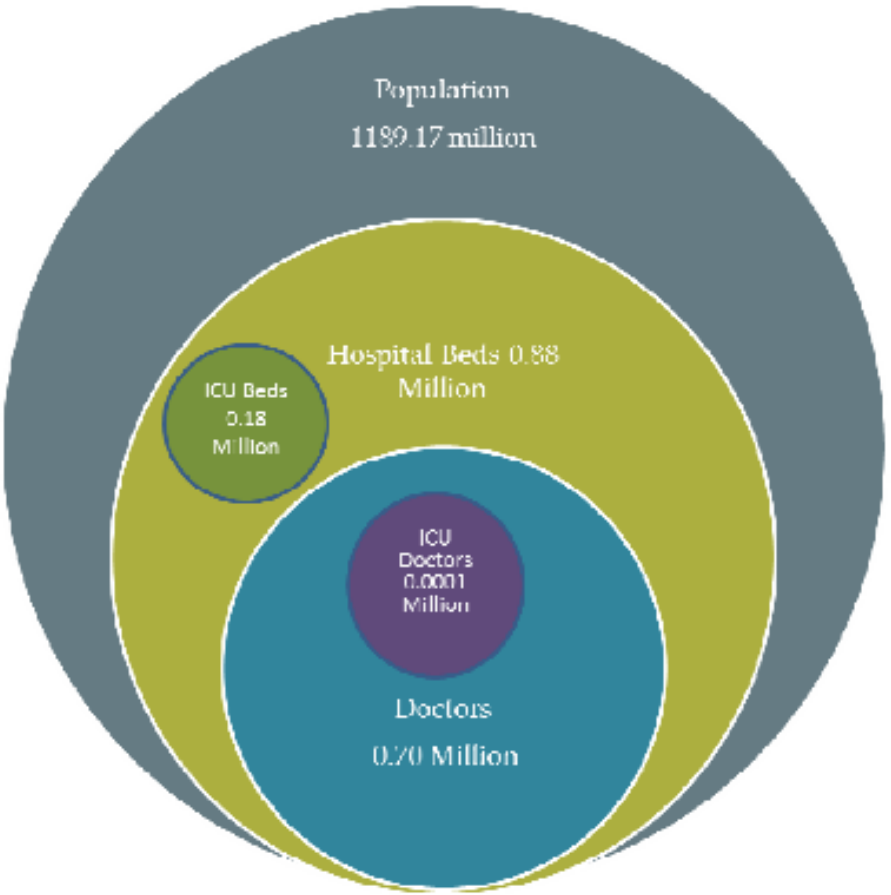
India

- Doctor-Patient Ratio - 1:2000
- Nurse-Patient Ratio - 1:2950
- Number of ICU Specialist Doctors ± 100
- Total Hospital Beds (2009) - 8,75,000
- Total ICU Beds (2009) - 180,000
- 67th Rank in Health Care amongst Developing Nations
- Registered allopathic Doctors 5.5 Lakhs and Nurses is 3,72,000 (MoH, GOI)

Rest of the World

- USA Doctor Patient Ratio - 1:390
- USA Doctors 954,000 (2010) and Nurses 3,100,000 (2009)
- UK (GB) Doctor Patient Ratio - 1:440
- UK Doctors 253,000 (2012) and Nurses 375,000 (2010)
- Australia Doctor Patient Ratio - 1:400

India Healthcare



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Critical Care Shortfalls in India

- Lack of standards/laws/regulations
- Need for structured training and formal certification for physicians and nurses
- ICU care is primitive or non existent at district hospitals in rural India
- Lack of grading of ICU's in Critical Care
- The number of available beds is disproportionately low, both in private and public hospitals
- Low doctor density ratio of 0.5 doctors per 1000 population

Critical Care Challenges

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Most hospitals today have difficulty in meeting the demand for quality Critical Care due the following factors:

- Lack of trained Intensivists and Nursing staff.
- Round the clock coverage
- Unavailability of concrete statistics/data relating Medical Errors, Length of Stay, etc.
- Lack of use of technology and available knowledge

EXPRESS Healthcare
INSIGHT INTO THE BUSINESS OF HEALTHCARE

TIMES NATION

PMO pushing to ramp up poor doc-patient ratio

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Tele-ICU

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- Tele-ICU
  - Assists hospitals by providing 24 x 7 coverage remote monitoring assistance to the bed side teams
  - Provides great value to hospitals providing secondary level and tertiary level care in Urban, Semi Urban and Rural areas



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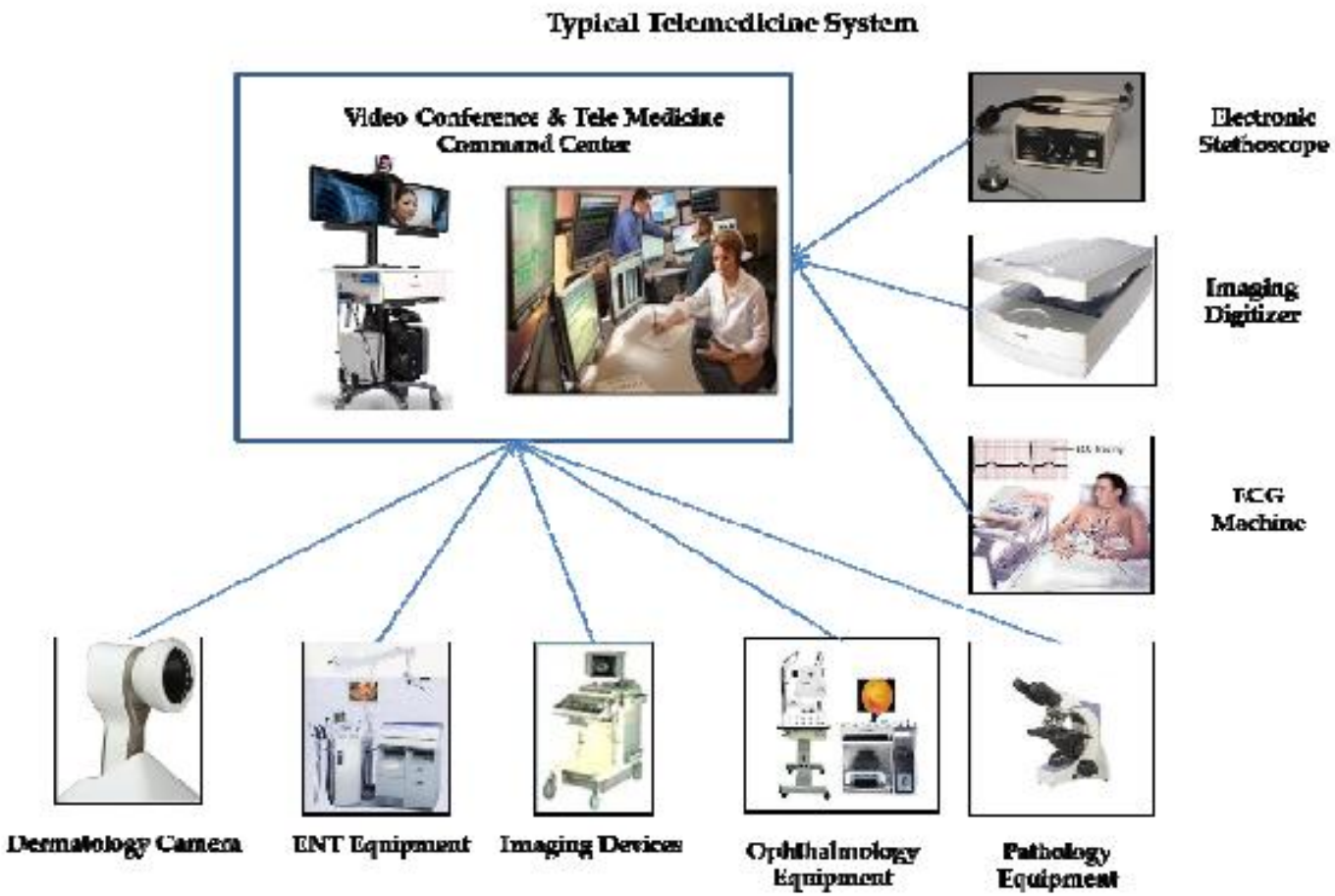
Typical telemedicine system



Tele ICU Model

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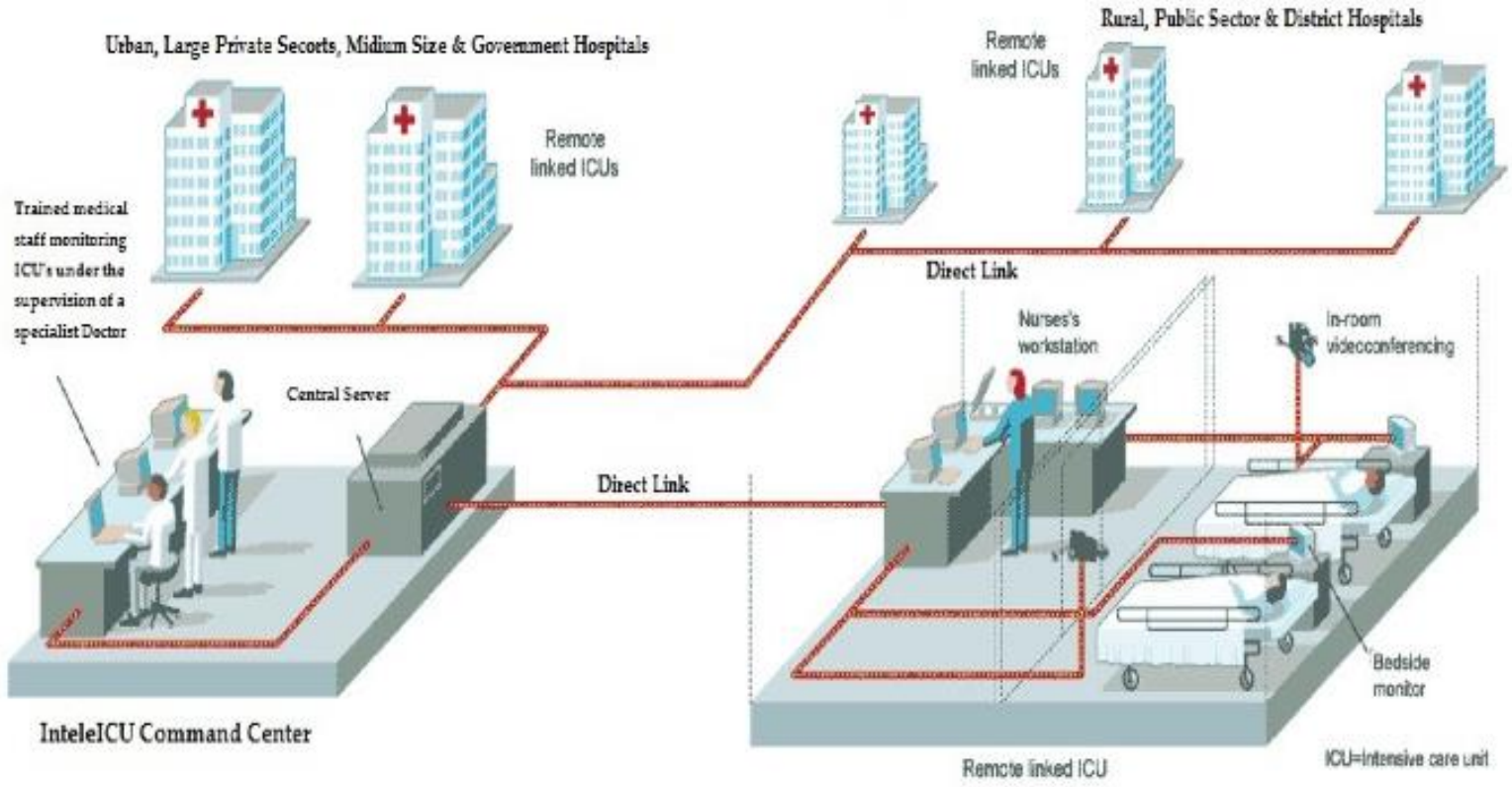

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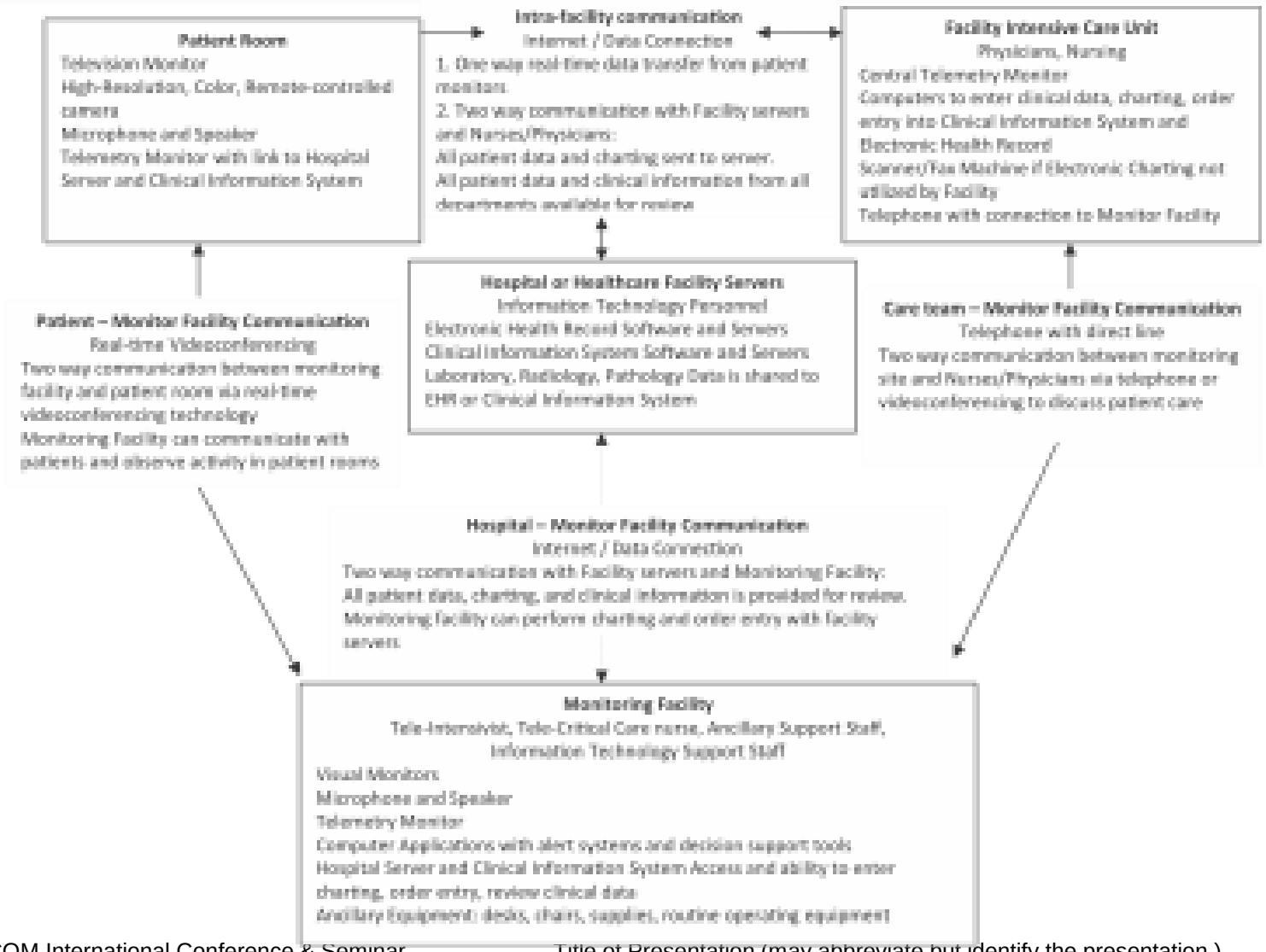
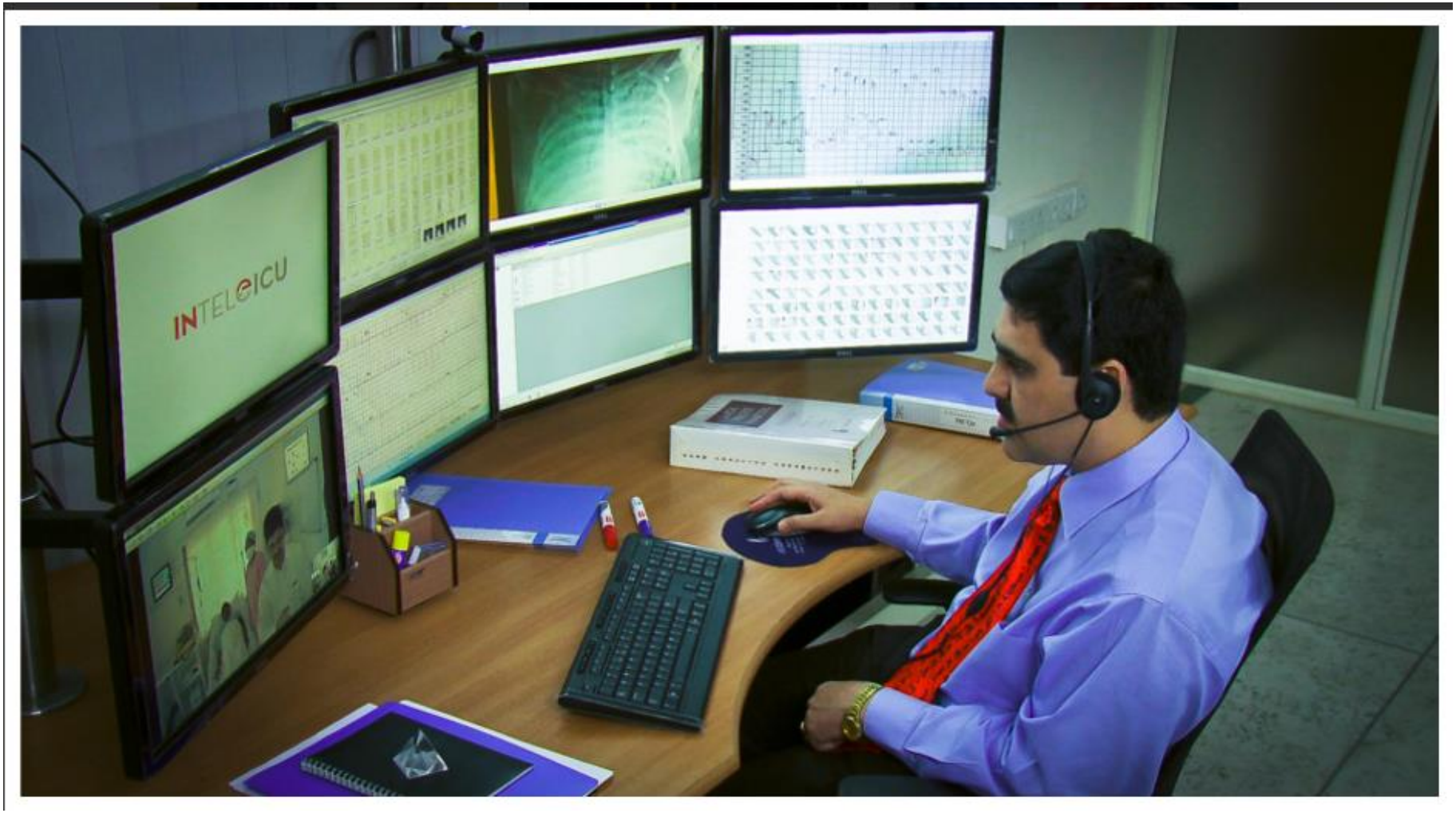
Tele- ICU Operational structure



Monitoring center intensivist



Remote ICU

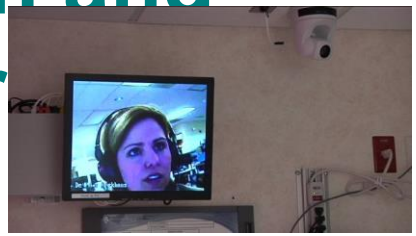
Communication

Data needed

- Video
- Continuous monitoring
- Lab data
- Intake/ Output data
- Ventilator data
- H&P and progress notes
- Ability to place notes
- Placing orders
- Radiology
- Others - EKG etc

Video

- Ability to move the camera - PTZ
- Can look at patients respiratory excursions to see if patient is in distress
- Look at patients chest, abdomen and ventilator graphics to see if ther dyssynchrony
- Talk to patients (if awake)
- Talk to patients families- even end of life discussion



- Talk to the staff - nurses, respiratory

Challenges

- **Language barrier- problem in India when monitoring center is located in a different state**
- **Getting patients and families to be comfortable with tele ICU**
- **Delay in transmission of data can be dangerous in ICU setting- especially in an emergency setting**
- **Always have back up plan**

Monitoring


iPad
21:30
98%
Patients
Monitor
Live
Mercer, Patrick
2462454423
Hospital C : RM209 : East Wing
Gender: --
DOB: --
ECG II
21:30:39
HR /min
199
ECG V1
AR1 mm[Hg]
118/95
(106)
ART
SPO2
SPO2
98
ST mm
V1 1.3
I 1.1
V2 1.3
II 2
NBP mm[Hg]
117/96
(106) 21:30
AR1-R /min
100
PVC /min
0
Temp °C
37
O2-IN %
--
O2-EX %
--
TP^-

Monitoring

- **Continuous monitoring**
  - **ECG**
  - **Arterial pressure tracing waveforms**
  - **CVP**
  - **ICP**
  - **oxygen saturation**
  - **blood pressure**

Challenges

- **Not all ICU's have central monitoring**
- **Some have single channel monitoring**
- **Central monitoring facility available but not used /upgraded due to financial considerations**
- **Delay in data acquisition**
- **Need continuous monitoring and trending**

Lab data

- **HIS and EMRs not available in many hospitals**
- **Data can be scanned and then entered into the monitoring centers EMR by monitoring center staff**
- **Direct capture of data from the HIS**
- **Allow remote access to HIS for the monitoring center physician**

Admission Documents | Summary | Diagnosis/Procedures | Flowsheets | Lab Data | Bedside Documents | X-Ray Images | Other Images | CT/MRI Images | Notes | Orders | Work Folder | Forms/Checklists | Discharge Documents

- Lab Flowsheet
- Hematology
- Heme Graph
- Coagulation
- Chem Graph
- Chemistry
- Enzymes
- Blood Gases
- Drug Levels
- Urine
- CSF
- Microbiology
- Virology
- Other
- Renal Calculations

Lab Flowsheet	27-02-2013 08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
WBC (x1000)		6								
Differential Count		41,21,3,2,1.5								
Platelets		150001								
Hgb		14.7								
Hct (PCV)		36.9								
PT		8.1								
PTT		30.2								
D-Dimer		102								
Fibrinogen		202								
Bleeding Time		3								
Clotting Time		17								
APTT		16.2								
Sodium		138								
Potassium		5.40								
Chloride		95								
HCO3		32								
Glucose		83								
Blood Urea		46								
Creatinine		7.7								
CPK										
CK-MB Index										
Troponin I										
Troponin T										
Labs Sent										
Arterial pH										
Arterial pCO2										
Arterial pO2										
Arterial HCO3										
Arterial SaO2										
Base Excess										
Labs Sent										
Labs Sent										

14-03-2013 17:18

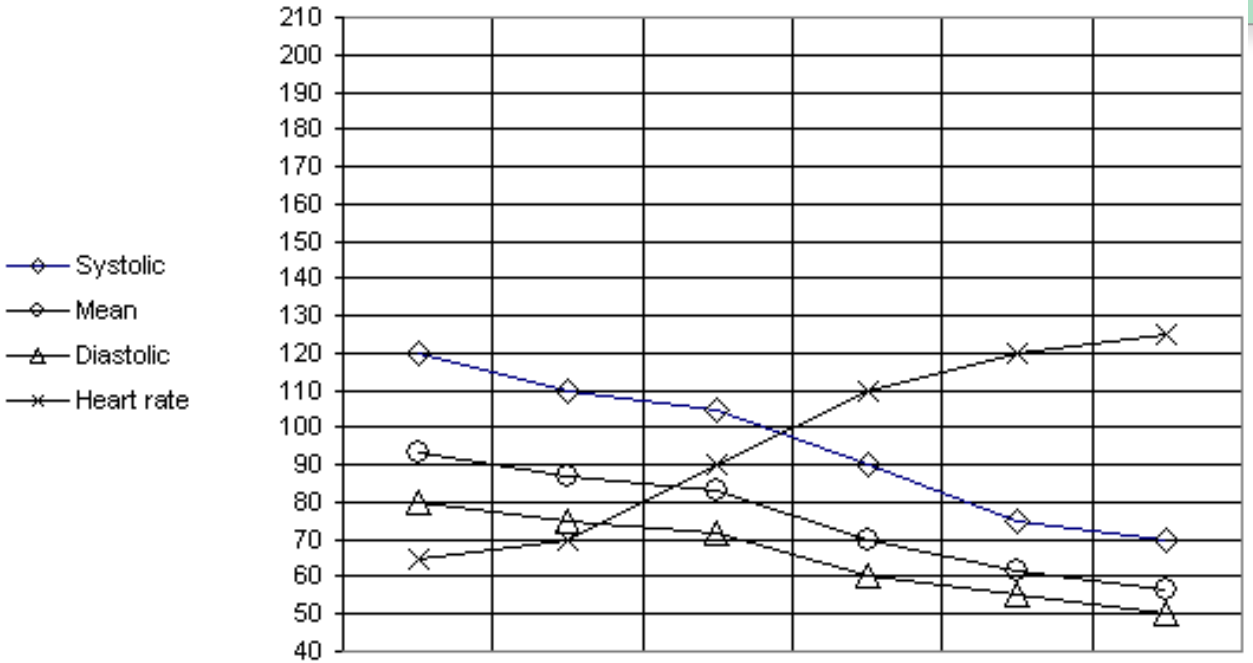
Start

17:19
14-03-2013

Intake / output - flowsheets

- **Usually entered by nurse**
- **Most Indian hospitals - still paper entry**
- **Needs to be entered into monitoring center EMR**
- **Data- scanned and faxed over every shifts**
- **Modern syringe pumps can feed data directly to the computer but very expensive**

Time	1	2	3	4	5	6
Temperature Axilla (A)	37.2	38.0	38.5	39.1	39.3	39.5
Oral (O) Rectal (R) Core (C)	A	O	O	O	O	O
Heart Rhythm						



Respirations						
Pain Scale q4h & PRN						
KCL						
PAP						
RAP/CVP						
LAP/PCWP						
CO/CI						
SVR/PVR						
MAP						
AUG Diastolic						
(UEDP-AEDP)/(USRP-ASBP)						

Ventilator data

- **Ventilator settings**
- **Ventilator waveforms**
- **Ability to look at waveforms and patient in real time**
- **Ventilator data can be acquired directly to the EMR but expensive and**

Patient data and order entry

- **Most hospitals don't have EMR's**
- **Even if EMRs are present - different EMR's may not share data well with the command center EMR**
- **Remote access required to the hospital EMR from command center**
- **Data crucial for making decisions- also important for documentation as their are now two different sets of physicians managing the patient**
- **Orders from the command center physician should be stored at remote ICU for documentation and legal purposes**
- **Closed loop communication required- to ensure orders carried out**
- **Majority of ICU's have multi "specialist" approach - need to give a cohesive plan involving key decision makers**

Demo05 - Gomathi - Demo Unit

Admission Documents | Summary | Diagnosis/Procedures | Flowsheets | Lab Data | Bedside Documents | X-Ray Images | Other Images | CT/MRI Images | Notes | Orders | Work Folder | Forms/Checklists | Discharge Documents

- 14-03-2013
  - **Infection Assessment**
    - VAP Assessment
    - BSI Assessment
    - Sepsis Assessment
- 27-02-2013
  - Monitor Strips 10:47 (Jayal

Infection Assessment

14-03-2013 17:12

VAP Assessment

Ventilator Associated Pneumonia

NOTE: Consider VAP only if Continuous Ventilation time => 48 hours

⊞ Ventilator Associated Pneumonia	
⊞ Culture Results	

BSI Assessment

⊞ Catheter-related Bloodstream Infection	

Sepsis Assessment

⊞ History and Symptoms of new infection	
⊞ Presentation	

NOTE: Please see Bundles Worksheet / Sepsis Graph for a trend representation of supporting data

⊞ Temperature (C)	
Temperature Max	
Heart Rate	
⊞ Arterial BP	
⊞ Non-Invasive BP	
Respiration rate (Latest)	
PaO2/FiO2 ratio	
SpO2	
⊞ SvO2	
⊞ ScvO2	
⊞ WBC (x1000/mcl)	
⊞ Platelets	
⊞ Lactic Acid (Serum Lactate)	
⊞ Glucose	
⊞ Creatinine	
⊞ Total Bilirubin	
⊞ APTT	
⊞ INR	

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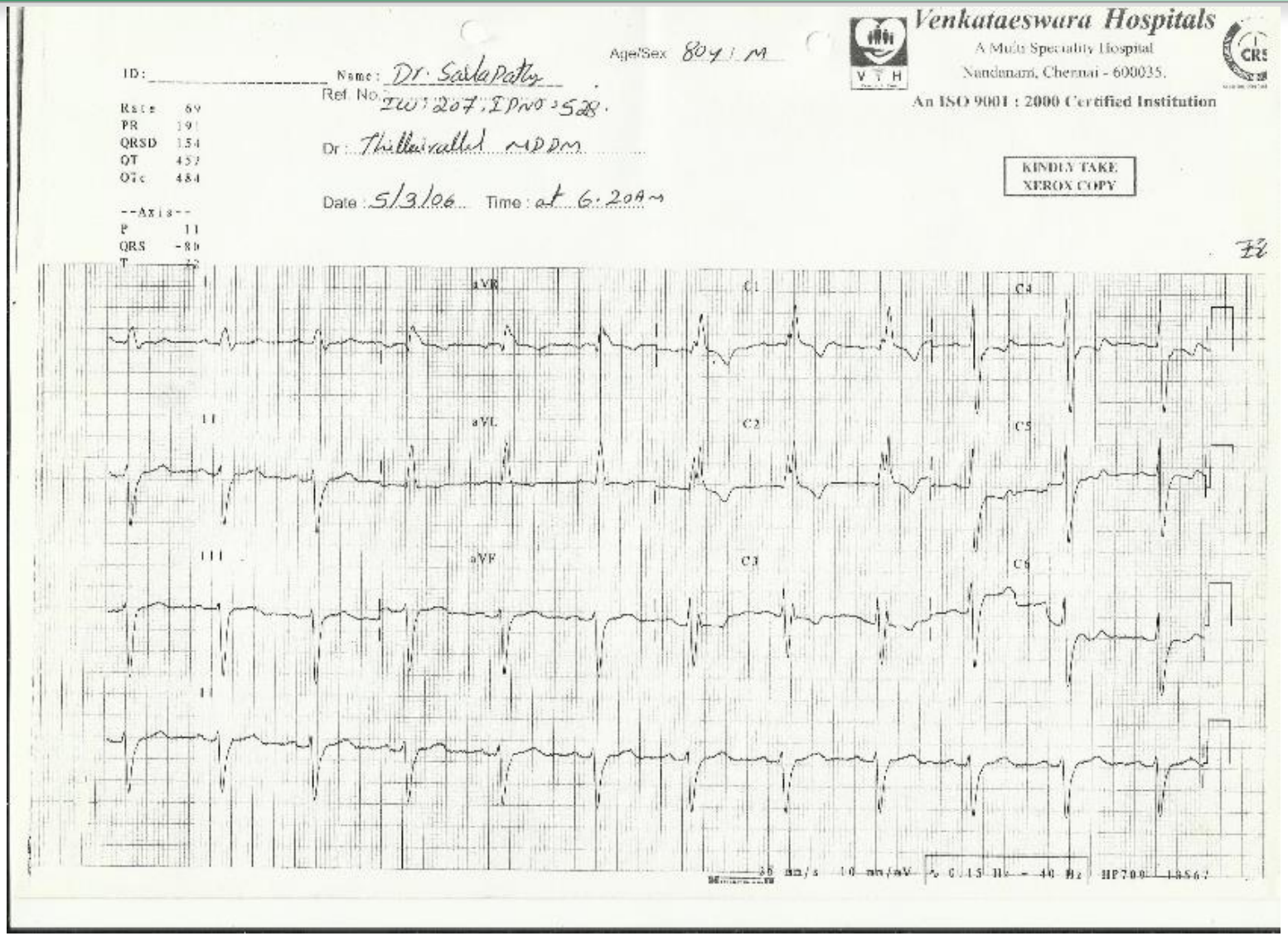
Radiology

- **PACS not available in many hospitals**
- **Medical grade scanners too expensive**

EKG


Venkataeswara Hospitals
A Multi Specialty Hospital
Nandanam, Chennai - 600035.
An ISO 9001 : 2000 Certified Institution
KINDLY TAKE XEROX COPY
ID:
Name: Dr. Sarla Patty
Ref. No: IW:207, IPNO:528.
Age/Sex: 80y / M
Dr: Thillainallal MDDM
Date: 5/3/06 Time: at 6.20Am
Rate 69
PR 191
QRSD 154
QT 457
QTc 484
--Axis--
P 11
QRS -86
T
aVR
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C1
C2
C3
C4
C5
C6
I
II
III
II
50 mm/s 10 mm/mV 0.15 Hz - 40 Hz HP700 1056

Additional benefits of Tele ICU

- **Implementation of protocols - to ensure standard of care is implemented**
- **Ensuring best practices are followed such as DVT prophylaxis and low tidal volume for ARDS**
- **A sense of security to patients, families and bedside staff**
- **Early recognition of problems**

What TeleICU cannot solve

- **Doctor needed for procedures , emergencies**
- **Over confidence because staff feels that doctors are always present**
- **The initial costs of setting up - especially in Indian ICU' s which are offline**

References


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The Journal of the American Medical Association


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Thank you for your attention !