TRAINING COURSE FOR CONSULTANTS AND SURVEY COORDINATORS
ON NATIONAL TB PREVALENCE SURVEYS
PHNOM PENH, CAMBODIA
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CXR Screening

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Radiography, CXR, X-ray


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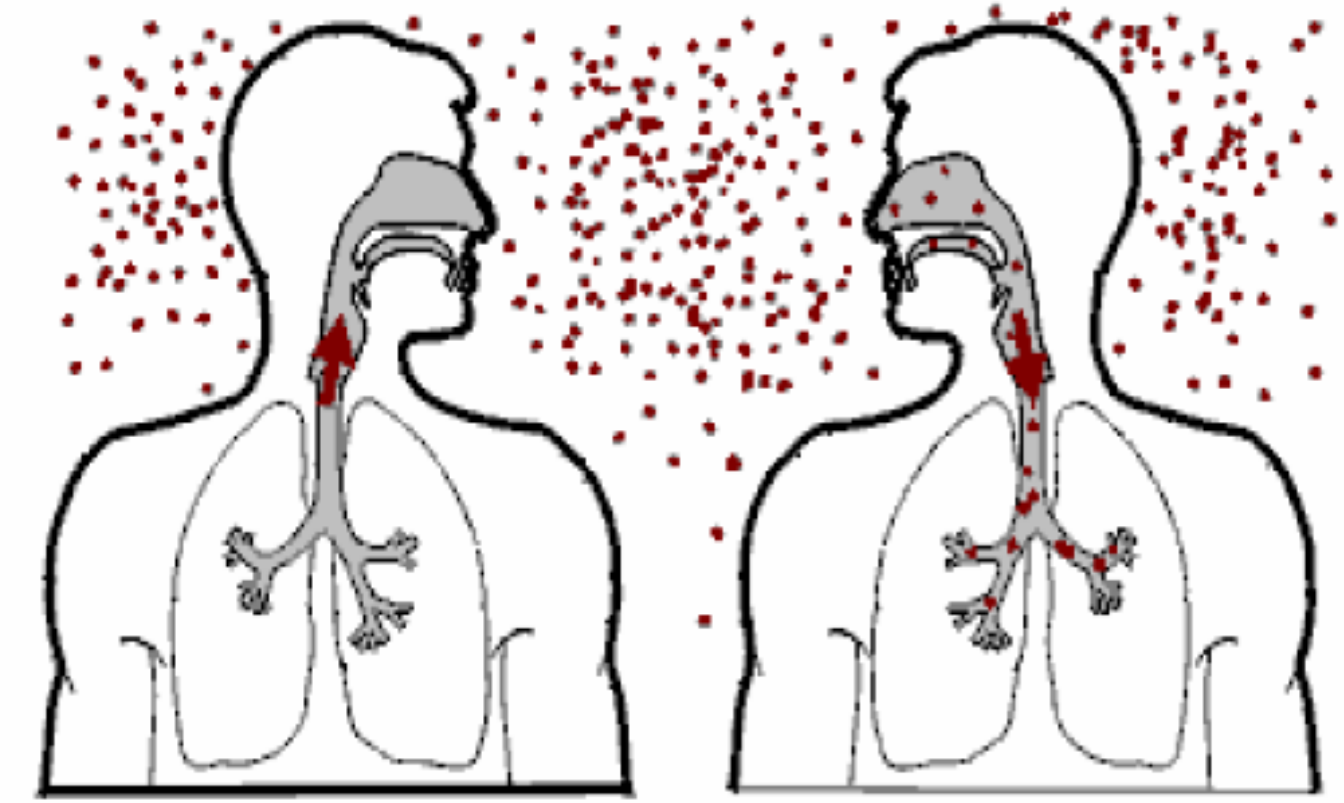
Screening, not diagnosis



- At field level - Normal or Abnormal.
- By employing intentional over-reading it is expected that there will be some CXR which are labelled ‘abnormal’ at the field level but ‘normal’ at the central level. As long as this percentage is small, it is acceptable.

- **Normal CXR** – A normal chest X-ray means clear lung fields and no abnormality detected. Participants with normal CXR have no radiological basis for undergoing bacteriological examination.
- **Abnormal CXR** - An abnormal chest X-ray means any lung (including pleura) abnormality detected on interpretation by the medical officer (e.g. opacities, cavitation, fibrosis, pleural effusion, calcification(s), any unexplained or suspicious shadow, etc.). Congenital abnormalities, normal variants, and bony abnormalities like fractures are excluded by definition as are findings like increased heart size and other heart-related abnormalities.

- A more detailed interpretation (audited reading) can be performed at the central level
- The central team should classify x-rays based on a classification decided upon earlier (as mentioned in the x-ray reference manual)
- May help identify quality issues with lab

CXR Selection

- ? Technology
- ? Number of units
- ? Value additions (e.g. CAD, Teleradiology)

X-ray technologies

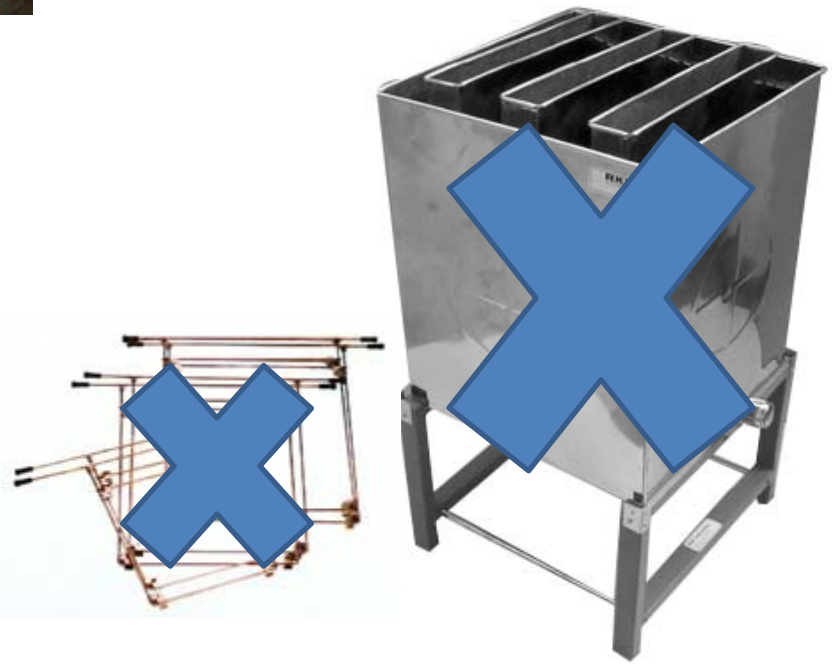
CONVENTIONAL

- Conventional radiography
- Conventional with autoprocessor

DIGITAL

- Computed radiography (CR)
- Direct radiography (DR, DDR)

Conventional radiography



Autoprocessor

Computed Radiography (CR)

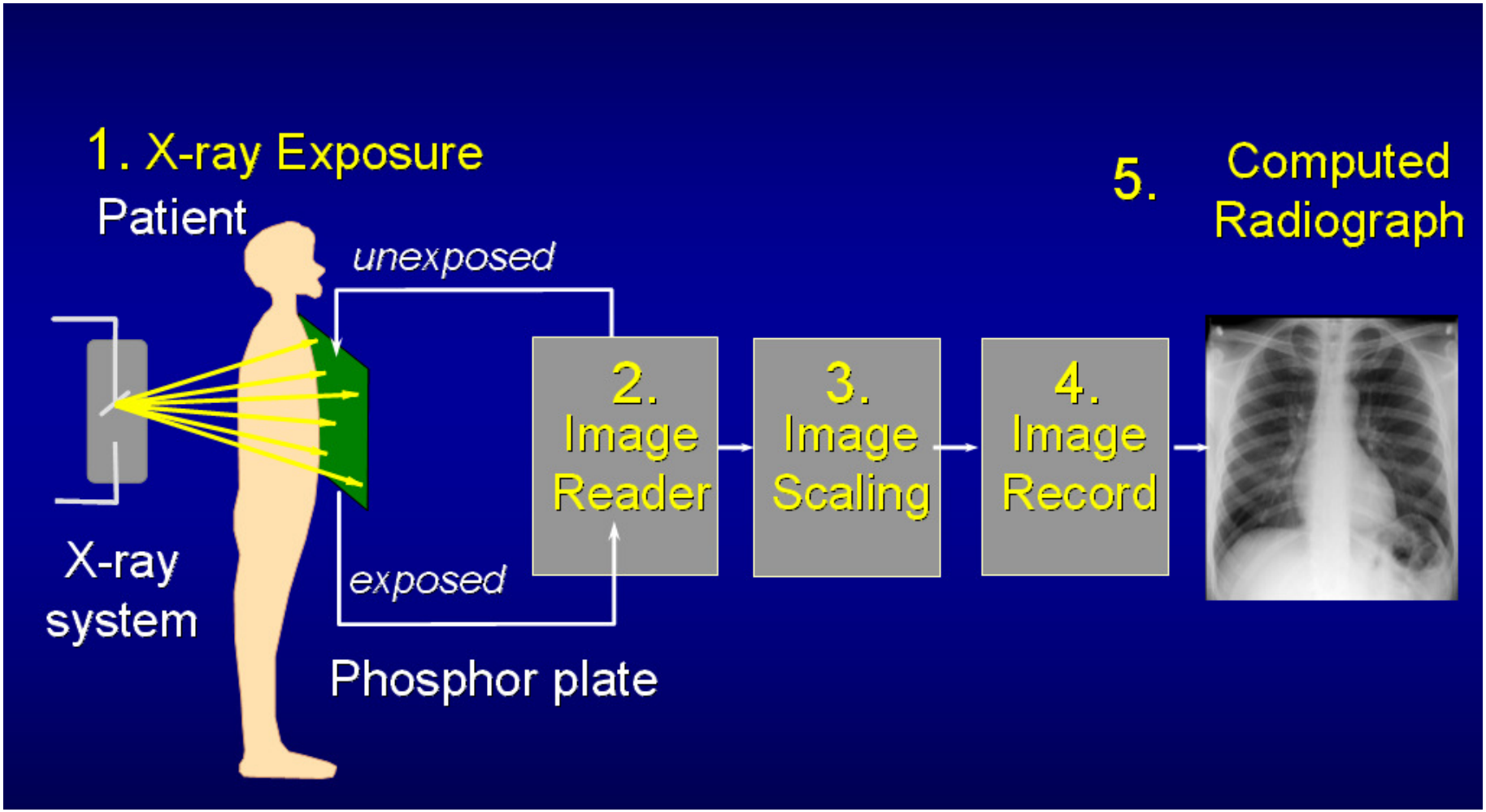


Image Acquisition

Patient information

Latent image produced

CR Reader

Latent image extracted

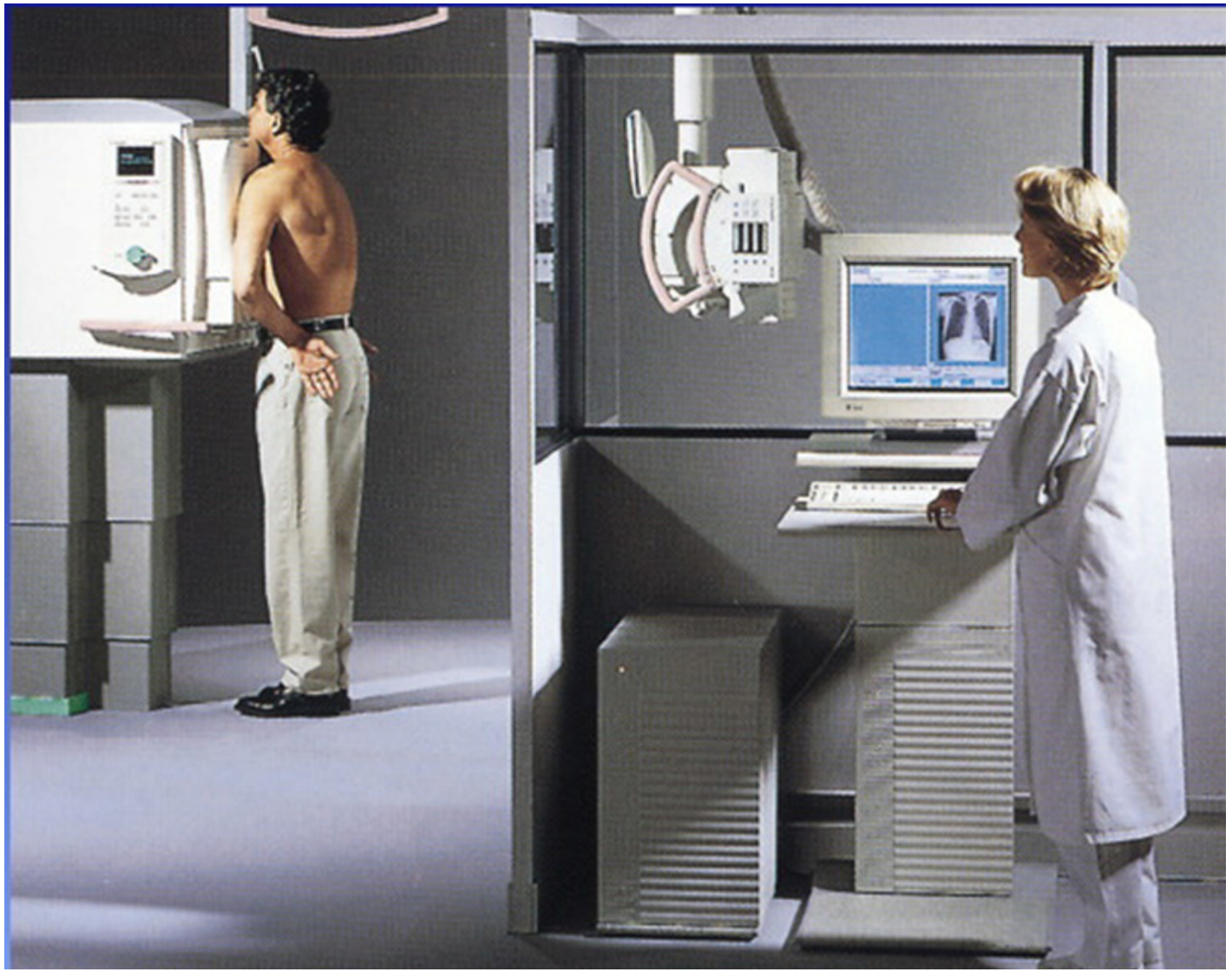
CR QC Workstation

DICOM / PACS

Laser film printer

Display / Archive

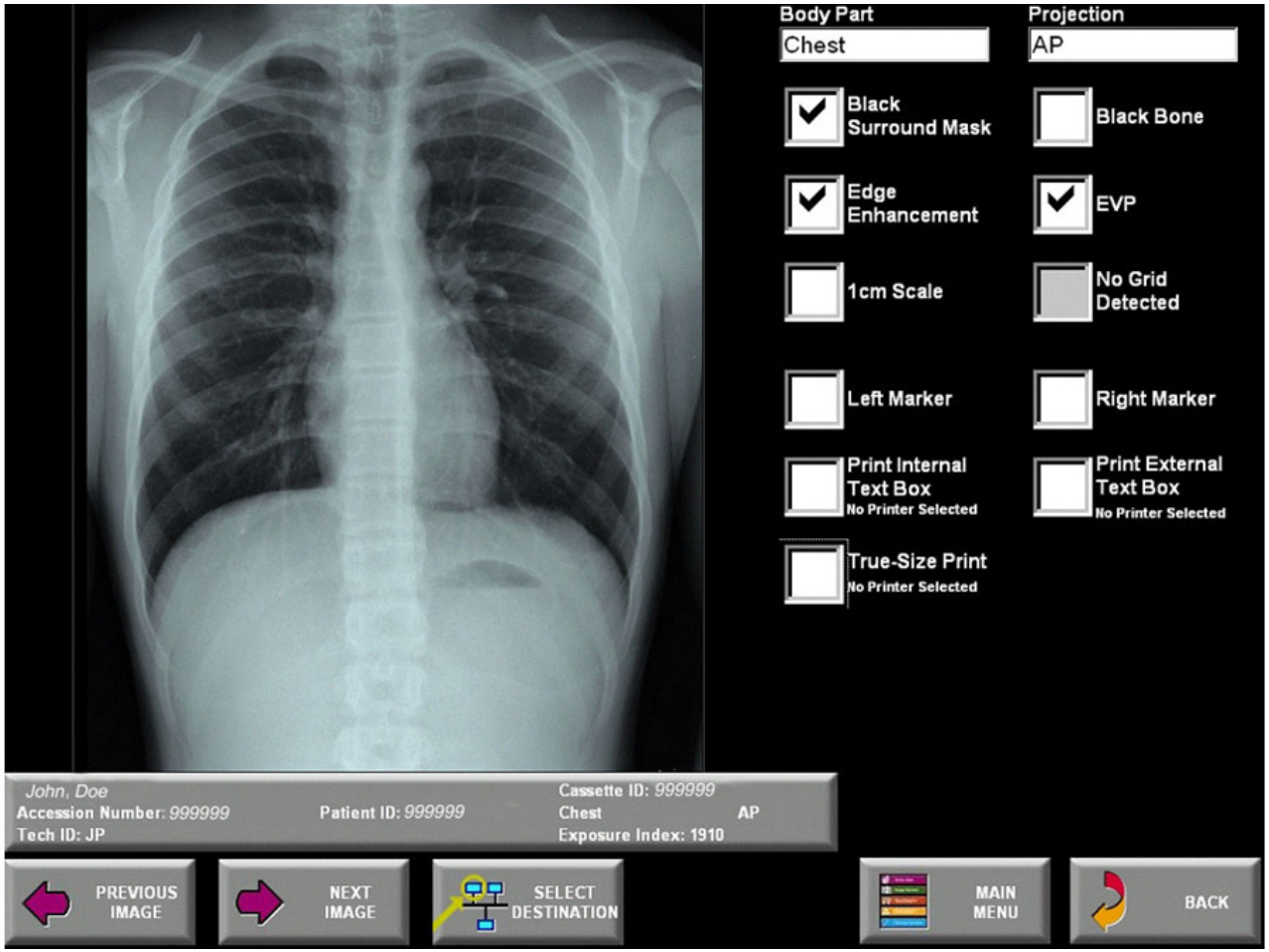
Direct Radiography

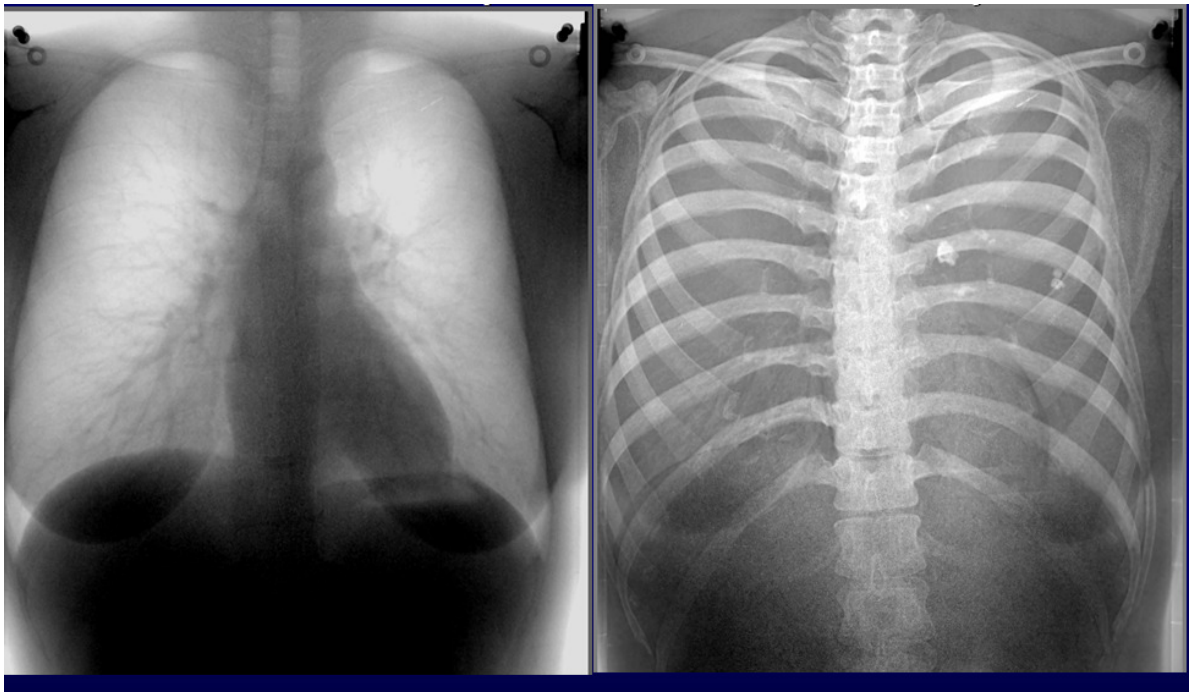


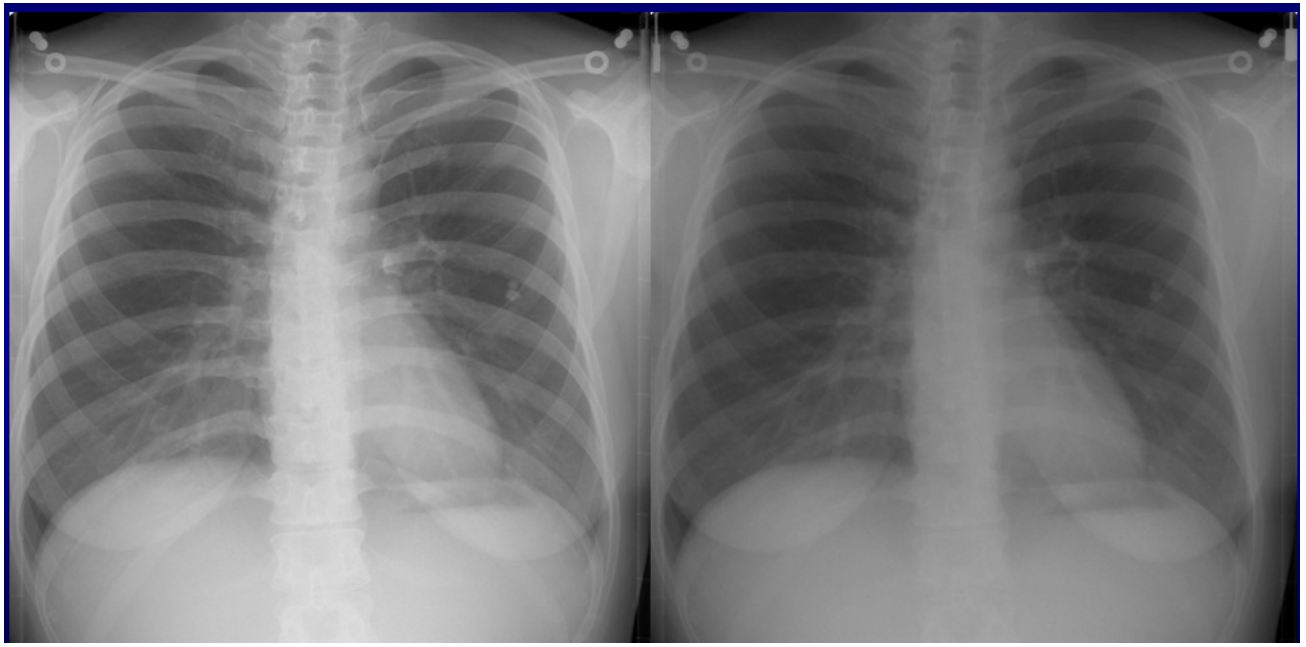
DDR

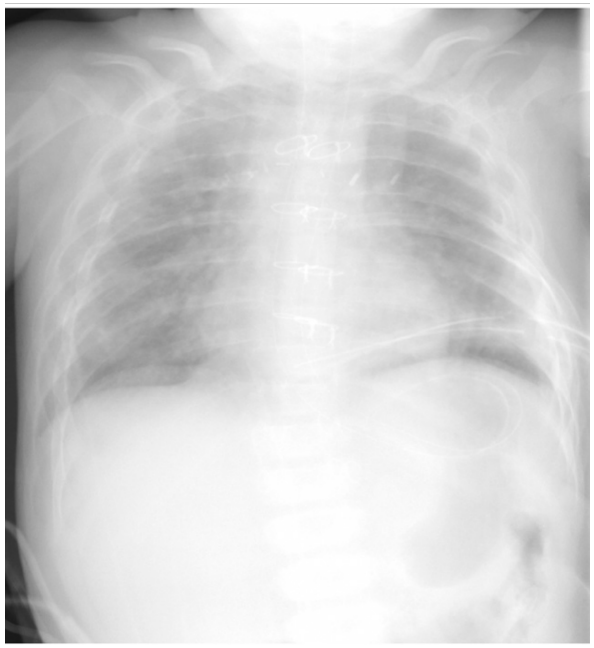
- Flat panel
- CCD
- CMOS
- Slot-scan

Post processing – Digital only










www.xray2000.co.uk

Value additions

- Teleradiology
- CRRS
- Computer-Aided-Detection (CAD)
- Computed-Aided-Diagnosis (CADx)
- Temporal subtraction imaging

Comparison chart

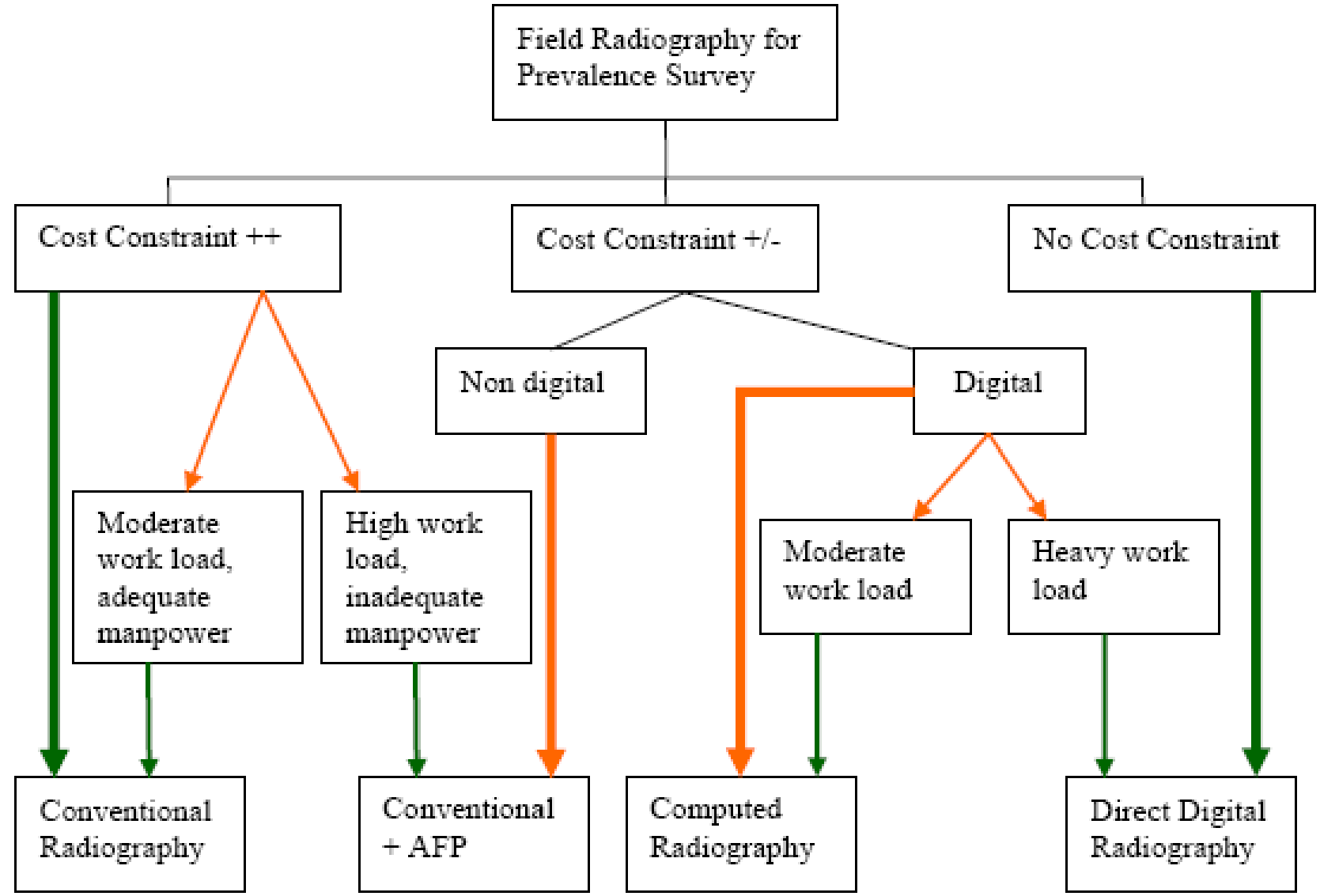
No.	Feature	Conventional	CR	Digital
1	Electronic data collection, reporting and storage, data management & privacy, back-up data	NO	YES	YES
2	High Image readability and quality	NO	YES/NO	YES
3	Value additions (CAD, Teleradiology)	NO	YES	YES
4	Use of films and chemicals (potential environmental issues)	YES	NO	NO
5	Radiation safety	NO*	NO*	YES*
6	Cost*	Cheap initially	Intermediate	Cheap in long run
7	Faster throughput	NO	NO	YES
8	Immediate image reproducibility	NO	YES	YES

Costs

- Conventional : 10-25,000 USD
- Autoprocessor: 7-12,000 USD
- CR: 50-70,000 USD
- DR with imaging panel: 100-120,000 USD
- DDR: 150,000 USD and above


MINXRAY

Long term costs
Hidden costs
Fine print
Logistics, maintenance, breakdown


Field Radiography for Prevalence Survey
Cost Constraint ++
Cost Constraint +/-
No Cost Constraint
Non digital
Digital
Moderate work load, adequate manpower
High work load, inadequate manpower
Moderate work load
Heavy work load
Conventional Radiography
Conventional + AFP
Computed Radiography
Direct Digital Radiography

CXR Requirements

- Planning
- Procurement
- Teamwork
- Allied equipment
- Radiation safety
- Legal and regulatory requirements
- Logistic requirements
- Technical assistance

Planning & Procurement

- Local technical expertise with TA
- Frequent bottleneck and time-consuming step
- Initiate early
- Attention to minute details
  - Accessories
  - Software/hardware
- Legal/regulatory issues

Radiation exposure

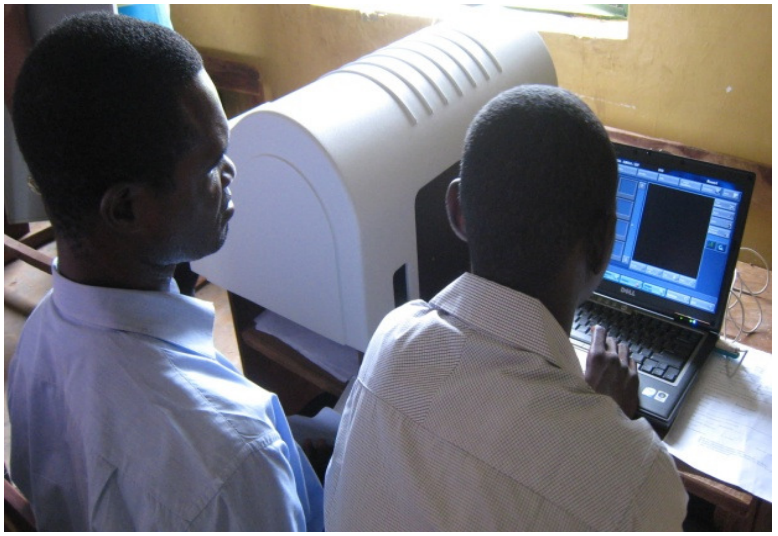
- MBUR Referral guidelines, Royal College of Radiologists London : 'typical effective dose = 0.02 mSv = 3 days app. Equivalent period of natural background radiation
- HPA – RCR: CXR associated risk of childhood cancer is very low and acceptable when compared with natural risk. Radiation doses resulting from Dx procedures present a negligible risk of induced hereditary disease in descendants of the unborn child
- ACR: Some procedures (incl. CXR in 1^{st} & 2^{nd} trimester) render so low exposures that pregnancy status need not be considered for a "medically indicated" exam, as long as good radiation practice is ensured
- At 1 meter, occupational exposure (if no apron is worn) is 0.1% of that which enters the patient.

Regulatory

- No ‘safe’ radiation, use regulated
- Radiation regulatory authority/body clearance
- Ethics committee clearance
- Consent, voluntary participation
- Exclude children, pregnant participants
- Good comprehensive protocol
- Timely engagement

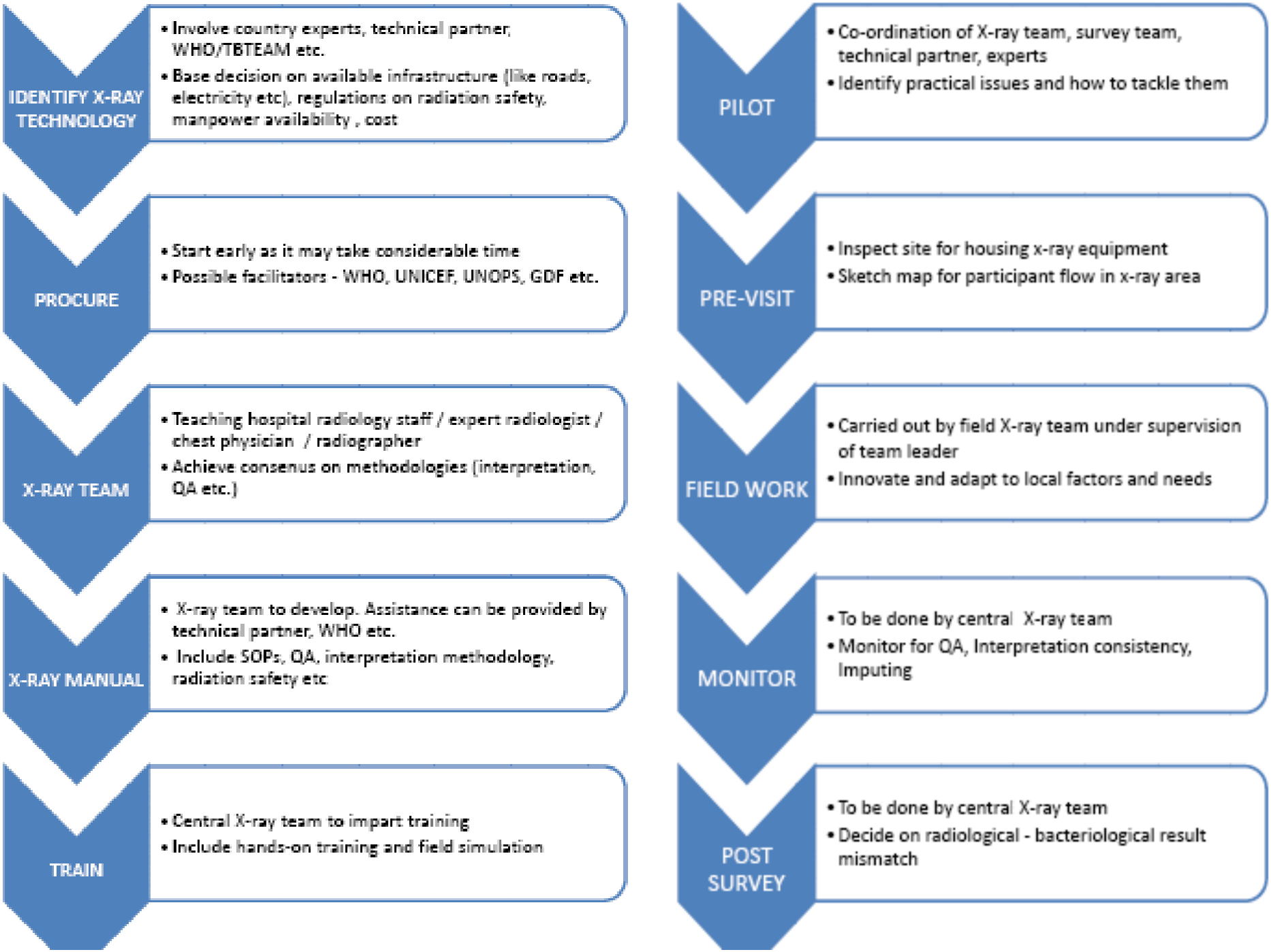
Logistics

Fieldwork



Technical Assistance

- WHO
- TBTEAM
- CDC
- KNCV
- JICA


IDENTIFY X-RAY TECHNOLOGY
• Involve country experts, technical partner, WHO/TBTEAM etc.
• Base decision on available infrastructure (like roads, electricity etc), regulations on radiation safety, manpower availability , cost
PROCURE
• Start early as it may take considerable time
• Possible facilitators - WHO, UNICEF, UNOPS, GDF etc.
X-RAY TEAM
• Teaching hospital radiology staff / expert radiologist / chest physician / radiographer
• Achieve consensus on methodologies (interpretation, QA etc.)
X-RAY MANUAL
• X-ray team to develop. Assistance can be provided by technical partner, WHO etc.
• Include SOPs, QA, interpretation methodology, radiation safety etc
TRAIN
• Central X-ray team to impart training
• Include hands-on training and field simulation
PILOT
• Co-ordination of X-ray team, survey team, technical partner, experts
• Identify practical issues and how to tackle them
PRE-VISIT
• Inspect site for housing x-ray equipment
• Sketch map for participant flow in x-ray area
FIELD WORK
• Carried out by field X-ray team under supervision of team leader
• Innovate and adapt to local factors and needs
MONITOR
• To be done by central X-ray team
• Monitor for QA, Interpretation consistency, Imputing
POST SURVEY
• To be done by central X-ray team
• Decide on radiological - bacteriological result mismatch

Thank you!