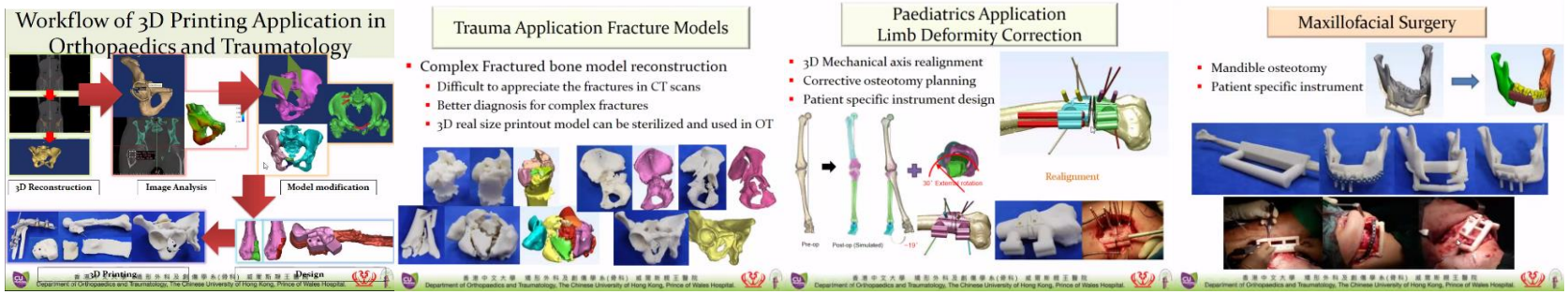
PWH/CUMC Training Log Book

1155174356 Chan Cheuk Ka

Date: 01/06/2022

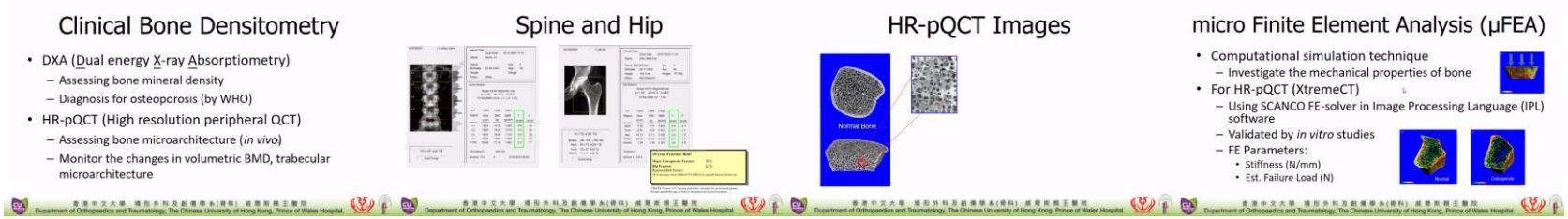
Session: Department of Orthopaedics and Traumatology

1. Computer-aided orthopaedic surgery
    a. Lecturer introduced the uses of real-time scanning (surgical navigation) during surgery to increase accuracy for implantation
    b. 

2. Computer-aided surgical modelling service
    a. Lecturer introduced the uses of 3D printing in medicine as best-fit replacements and implantations for bone structures
    b. 

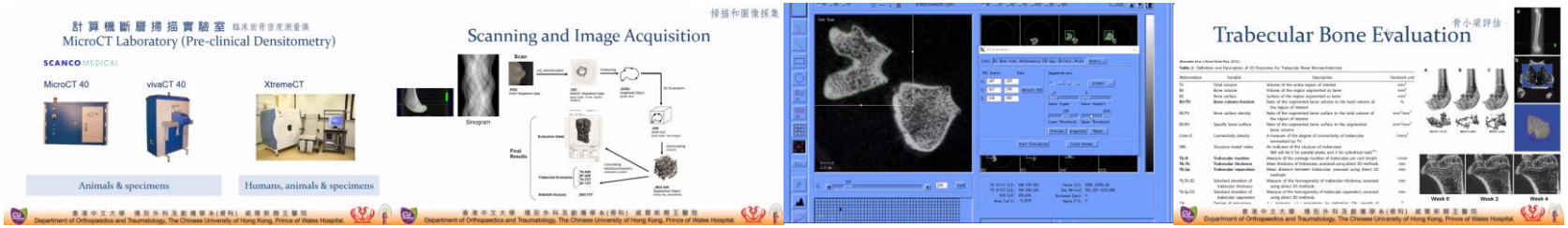
3. DXA / HR-pQCT
    a. Lecturer introduced the use of bone densitometry to analyse osteoporosis and fracture risks

b.



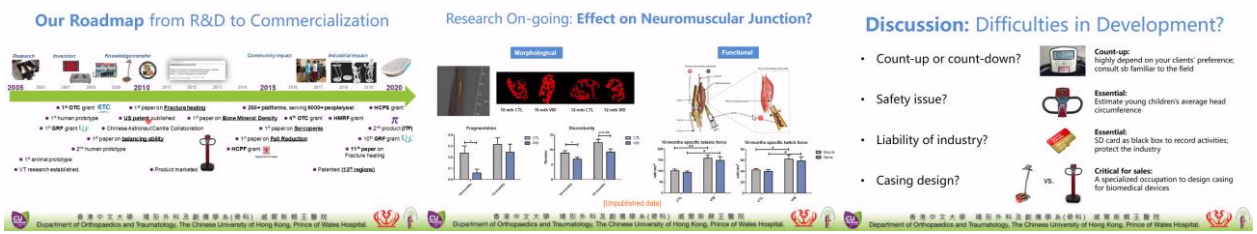
4. MicroCT / VivaCT, digital x-ray for small animals
    a. Lecturer introduced the use of MicroCT to produce a fine detailed 3D model of bone for bone micro-architecture evaluation

b.



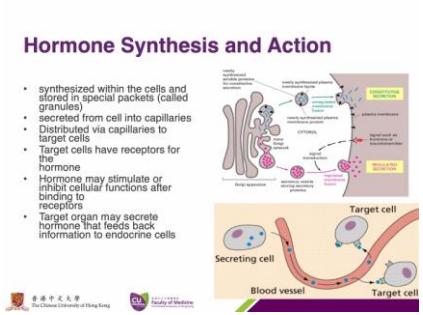
5. Vibration platform
    a. Lecturer introduced the use of vibration platform to combat bone density loss for bedridden patients as well as some insights into the product design process and relevant considerations

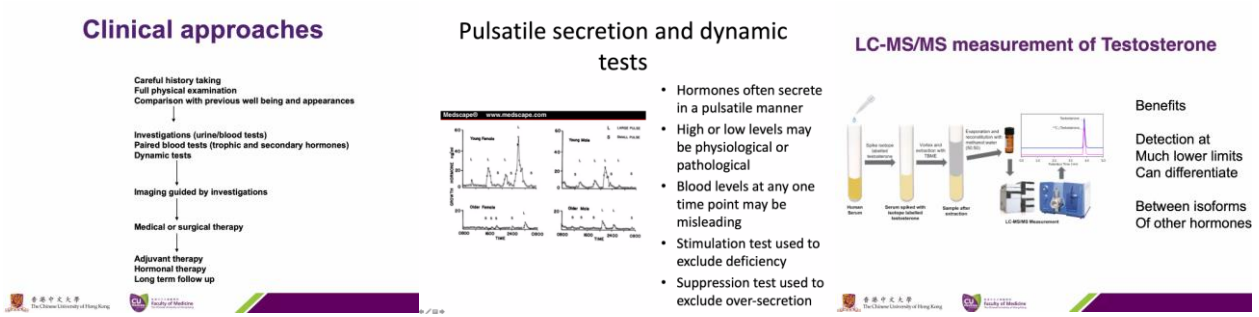
b.



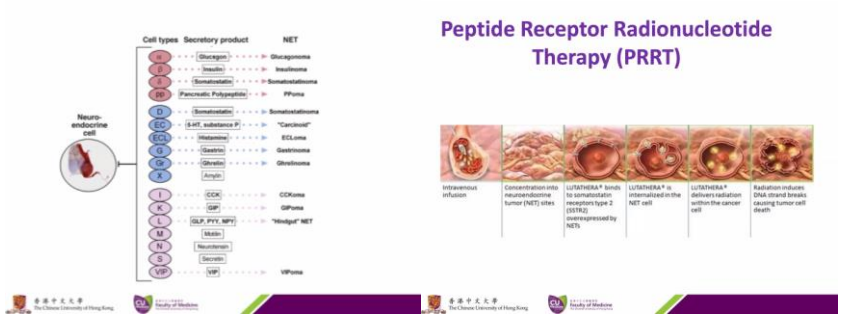
Date: 01/06/2022

Session: Department of Medicine and Therapeutics - Division of Endocrinology & Diabetes

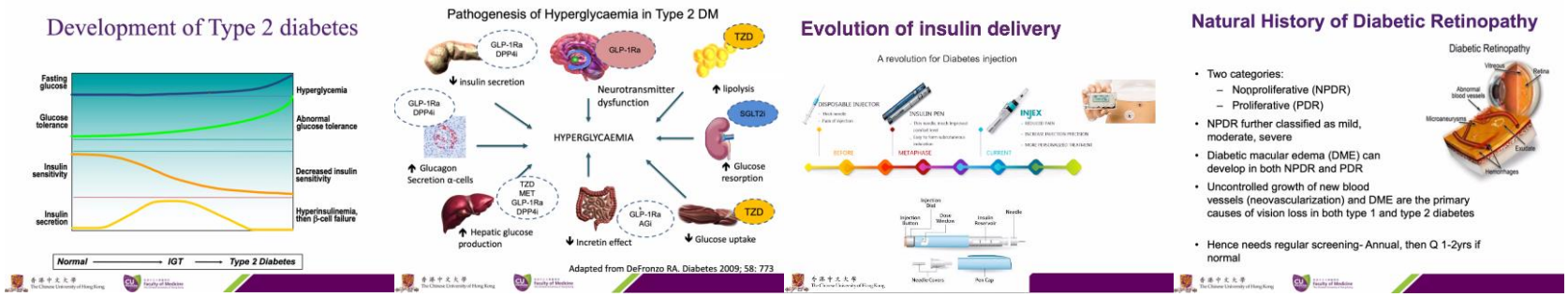
1. Principles of endocrine disorders and common endocrine conditions
    a. Lecturer helped us revise some important concepts of the hormonal system
    b. 

2. Glucose homeostasis, hyperglycaemia, diabetes and complications, care
    a. Lecturer outlined the clinical procedures to the diagnosis for diabetes and precautions necessary to prevent mis-diagnosis
    b. 

3. Examples of technology facilitating endocrine care
    a. Lecturer introduced different types of treatment for neuroendocrine tumour

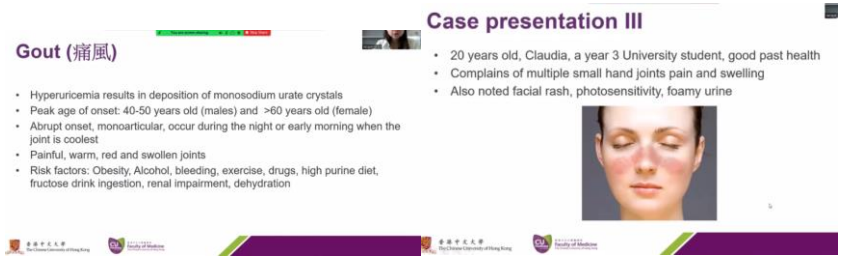
b. 

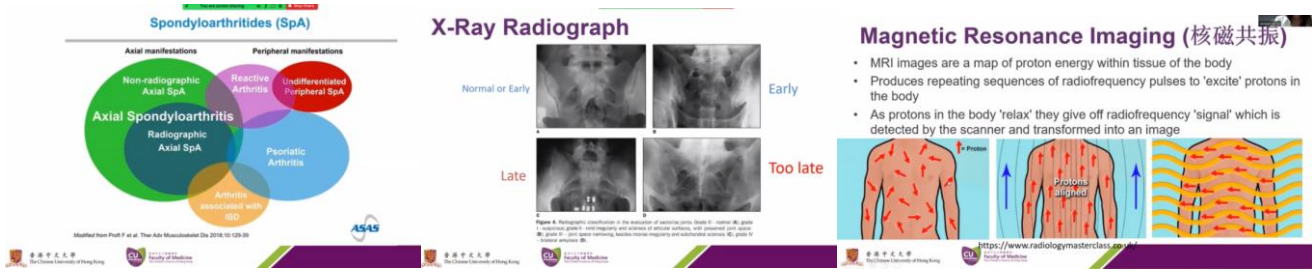
4. Examples of technology facilitating diabetes care
    a. Lecturer explained the diabete types and their development as well as the suitability of different treatment approachs

b. 

Date: 01/06/2022

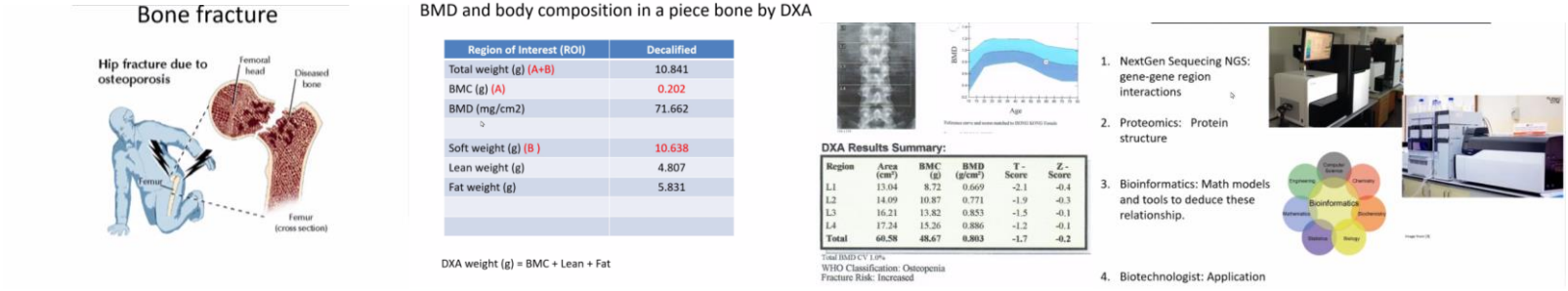
Session: Department of Medicine and Therapeutics - Division of Rheumatology

1. Rheumatological diseases and osteoporosis
    a. Leceturer introduced a few cases of rheumatological patients and their treatments
    b. 

2. SpA
    a. Lecturer described the use of MRI to detect early stages of SpA
    b. 

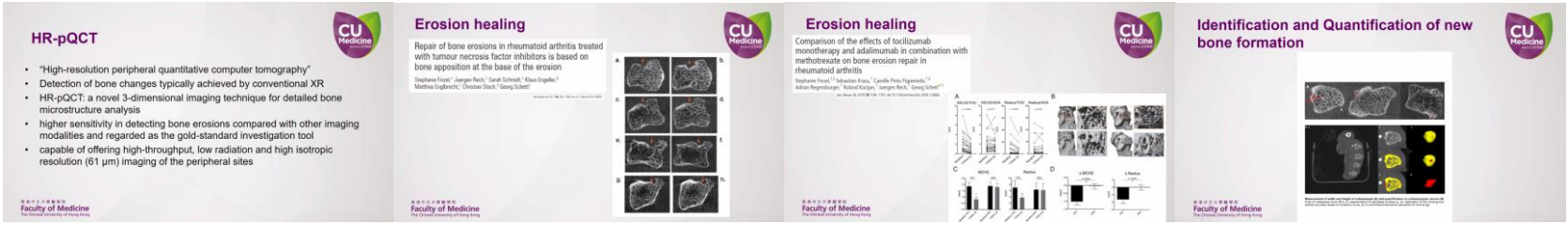
3. Bone anatomy and bone density assessment
    a. Lecturer discussed the most common injuries and causes for osteoporosis as well as presenting some treatment options

b.



4. HR-pQCT
    a. Lecturer discussed the advantages of HR-pQCT imaging over traditional technology as well as how it facilitates bone treatment diagnosis

b.



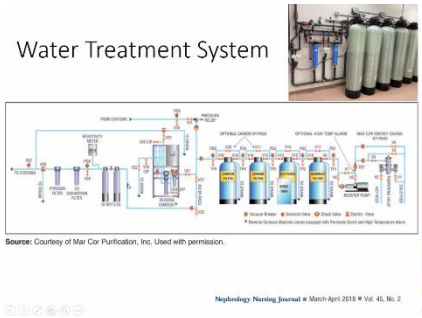
Date: 02/06/2022

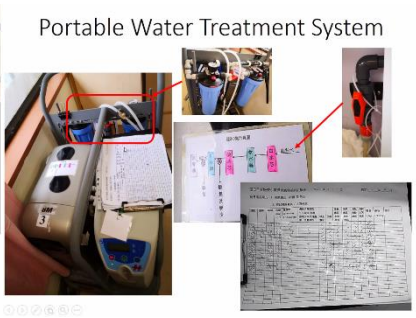
Session: CU Medical Centre Training

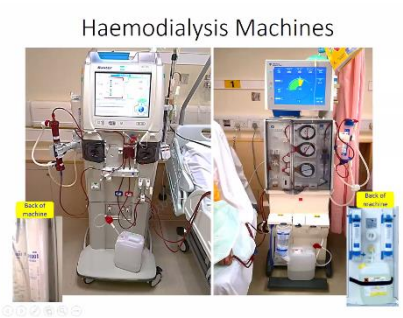
1. Live ACL reconstruction surgery
    a. We had the opportunity to watch a live ACL reconstruction surgery done by the doctor. It was a minimally invasive surgical operation. The doctor first made three small incisions; he then extracted two tendons from the hamstrings and stitched them together to form a graft ligament. Two holes were then drilled into the femur and tibia, where the graft ligament was threaded through. Screws and a metallic button cap were used to secure the graft. He also did the mobility test before and after the graft installation, and we were able to see that the movement of the knee was successfully restrained after the graft was in place.
2. Pathology
    a. We have toured the pathology department, where analysts performed tests on samples using various automated machines, including centrifuges, blood cell counters, coagulation testers, and antigen testers. We were also introduced to complementary machines such as freezers and the monitory system that ensures appropriate lab conditions.
3. Radiology
    a. We were briefly introduced to the capabilities of the Magnetic Resonance Linear Accelerator as well as to the control room. We were also briefed on the safety precautions necessary when approaching the machine.
4. Pharmacy
    a. We were introduced to machines that sort, combine, and package different medications into a single uni-pill to allow patients to take their medication without mixups easily.
5. Surgery
    a. We were introduced to the vital support machine used in surgery ventilations as well as its failsafes.
6. Sports Medicine and Rehabilitation
    a. We briefly toured the exercise room for patients, where they can use a variety of machines and tools to aid their rehabilitation.

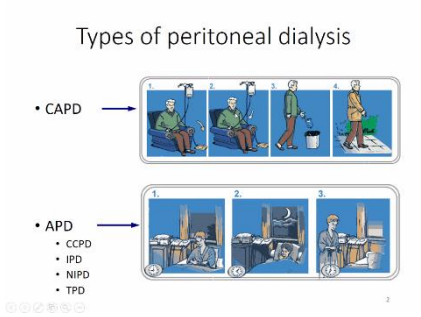
Date: 06/06/2022

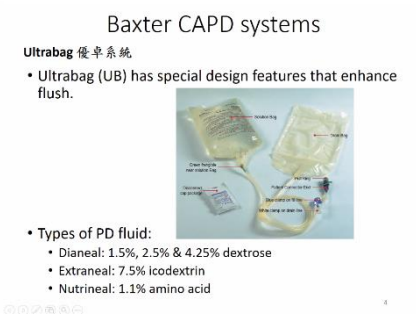
Session: Department of Medicine and Therapeutics - Division of Nephrology

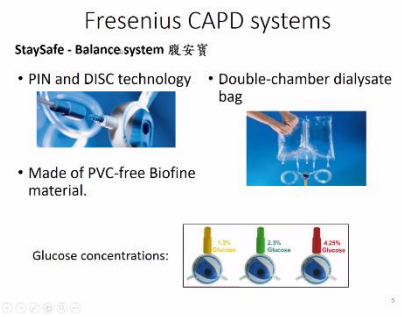
1. Haemodialysis
    a. Lecturer introduced the complementary facilities and machines necessary for haemodialysis
    b. 

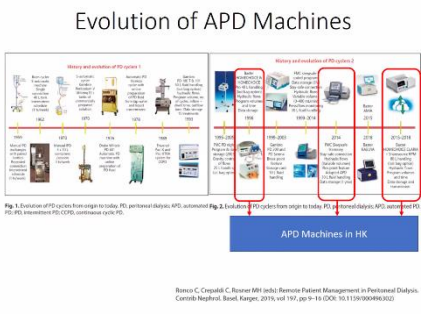




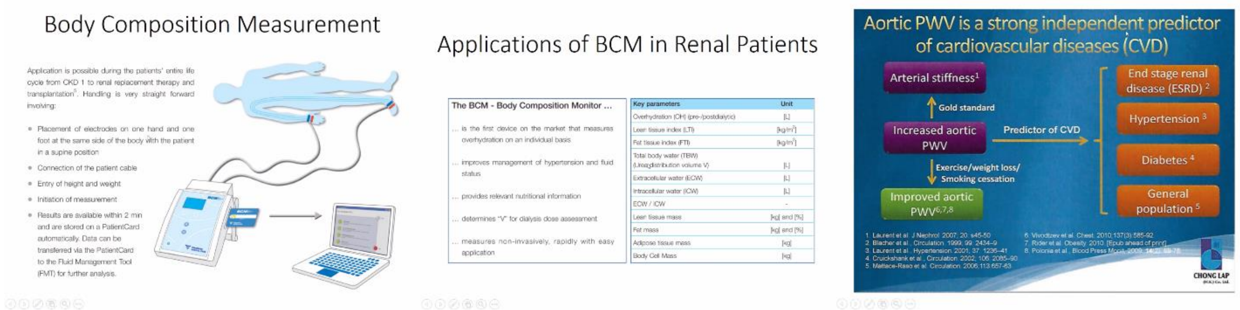
2. Peritoneal dialysis
    a. Lecturer briefly introduced different designs for peritoneal dialysis
    b. 





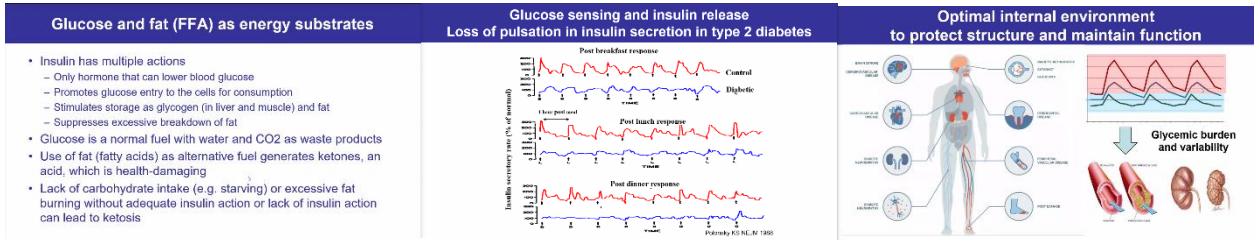


3. Body composition measurement, Pulse velocity measurement
    a. Lecturer briefly introcued these measurement metrics


Body Composition Measurement
Application is possible during the patients' entire life cycle from CKD 1 to renal replacement therapy and transplantation. Handling is very straight forward involving:
Placement of electrodes on one hand and one foot at the same side of the body with the patient in a supine position
Connection of the patient cable
Entry of height and weight
Initiation of measurement
Results are available within 2 min and are stored on a PatientCard automatically. Data can be transferred via the PatientCard to the Fluid Management Tool (FMT) for further analysis.
Applications of BCM in Renal Patients
The BCM - Body Composition Monitor ...
... is the first device on the market that measures overhydration on an individual basis
... improves management of hypertension and fluid status
... provides relevant nutritional information
... determines "V" for dialysis dose assessment
... measures non-invasively, rapidly with easy application
Key parameters
Unit
Overhydration (OH) (pre-/postdialytic) [L]
Lean tissue index (LTI) [kg/m²]
Fat tissue index (FTI) [kg/m²]
Total body water (TBW) (Urea distribution volume V) [L]
Extracellular water (ECW) [L]
Intracellular water (ICW) [L]
ECW / ICW -
Lean tissue mass [kg] and [%]
Fat mass [kg] and [%]
Adipose tissue mass [kg]
Body Cell Mass [kg]
Aortic PWV is a strong independent predictor of cardiovascular diseases (CVD)
Arterial stiffness1
Gold standard
Increased aortic PWV
Predictor of CVD
Exercise/weight loss/ Smoking cessation
Improved aortic PWV6,7,8
End stage renal disease (ESRD) 2
Hypertension 3
Diabetes 4
General population 5
1. Laurent et al. J Nephrol. 2007; 20: s45-50
2. Blacher et al., Circulation. 1999; 99: 2434–9
3. Laurent et al., Hypertension. 2001; 37: 1236–41
4. Cruickshank et al., Circulation. 2002; 106: 2085–90
5. Mattace-Raso et al. Circulation. 2006;113:657-63
6. Vivodtzev et al. Chest. 2010;137(3):585-92
7. Rider et al. Obesity. 2010. [Epub ahead of print]
CHONG LAP
b.

Date: 06/06/2022

Session: Department of Medicine and Therapeutics - Division of Clinical Pharmacology

1. Diabetes
    a. Lecturer briefly introduced the definition of diabetes
    b. 

2. Continuous glucose monitoring and insulin infusion system
    a. Lecturer briefly introcued the types of CGM systems and discussed the design challenges, as well as the types of insulin pumps and their advantages and trade-offs

b.

Continuous glucose monitors (CGM)

Non-invasive minute-to-minute measurement of glucose

Inserter device

Sensor
measure interstitial glucose via a sensor (enzyme based: glucose oxidase, fluorescence)

Transmitter/Detector
couples to sensor and transmits wireless data to mobile device

Reader/Mobile Phone
displays/stores data, gives trend info and alarms, user interface

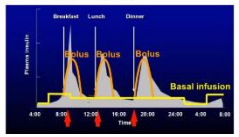
Share data with health care professional

Data Cloud

Real time remote monitoring by care partner

Insulin pumps

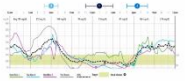
- *Continuous subcutaneous Insulin Infusion (CSII)*
- *More* physiological replacement insulin
- Basal + Bolus = Total daily dose (TDD)



Types of CGM

1. Professional (blinded CGM)
   - Sensor, no user interface
   - Glucose profiles uploaded for review by health professional (and patient)
   - Treatment adjustment, identifying undetected hypoglycaemia

e.g. Medtronic IPro 2



Standalone insulin pump

Insulin reservoir

Cannula

Pre-programmed basal insulin infusion rates over 24 hours

Bolus button (most have inbuilt bolus wizards)

Choice of pumps

Tethered pumps

Tandem t:slim

Medtronic 640g Sensor augmented

Dana

Patch pumps

EOflow

Omnipod

Medtrum

Patch pumps

Pod holds 200 units insulin

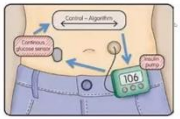
Change every pod every 2-3 days

Issues and challenges with CGMs

- Sensor life
- Sensor sites and size – the dreaded doorframe
- Skin irritation from adhesives
- $$$Price

Automated insulin delivery (also known as Hybrid closed loops, artificial pancreas)

- **CGM** senses the glucose level and sends information to the insulin pump via Bluetooth
- **Automated algorithm** to automatically adjust **BASAL** insulin delivery (automode)
- Still have to **manually BOLUS** based on meal and insulin carbohydrate ratios



Safety and tolerability

- Adverse event reporting
- Adverse event
- Adverse device event (ADE)
- Severe adverse device event (SADE)
- Device deficiencies

Skin irritation
Sensor site

Why CSII vs. MDI

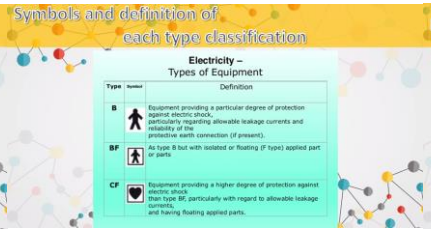
- Improve glucose control
  - Lower HbA1c
  - Less hypoglycaemia
  - Reduce impaired hypoglycaemia awareness
- Better quality of life
  - Less emotional burden
  - Fewer injections: 28 MDI vs 2 CSII insertions / week
- Reduce risk of CVD and premature death Swedish Diabetes Registry Steineck BMJ 2015
- Pump does not do it all
- Still need to perform hstix
- Automode vs retaining control of BG
- Physicality of having a device attached all the time

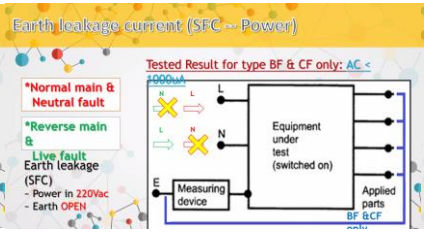
Date: 07/06/2022

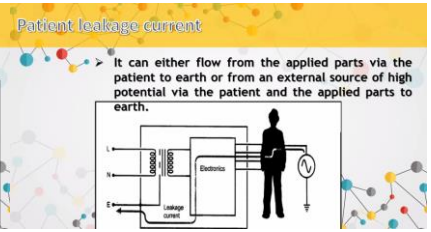
Session: Electrical and Mechanical Services Department

1. Medical hazards and safety precautions
    a. Lecturer outlined the steps for wearing and removing PPE
    b. 

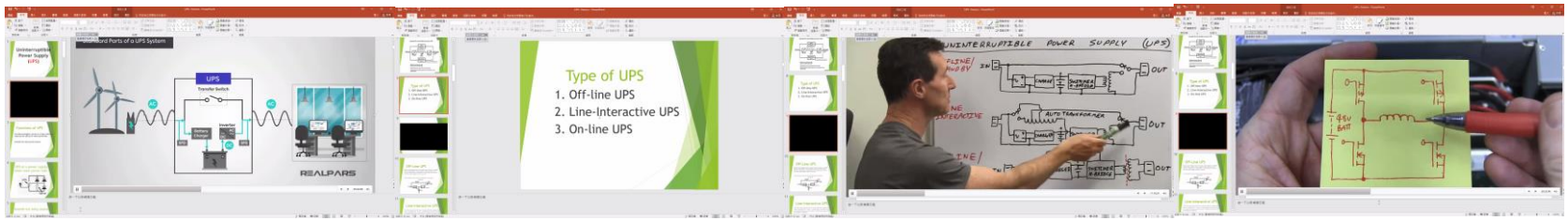
2. Electrical safety tester
    a. Lecturer introduced the different classes and categories of protective equipment and to what extent they are rated to protect
    b. 

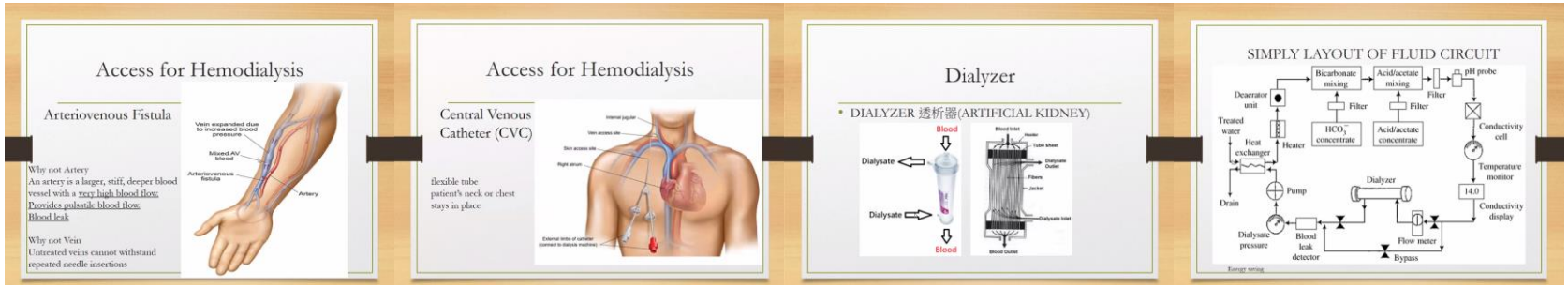






3. Infusion pump and tester
    a. Lecturer outlined the uses of infusions pumps and ways to test and calibrate their functionality
    b. 

4. Uninterruptible power supply
    a. Lecturer introduced how UPS can help protect sensitive equipment from damage due to irregular supply voltage, as well as the capabilities of different types of UPS
    b. 

5. Haemodialysis unit
    a. Lecturer introduced the considerations for blood vessel choice and the rationale for haemodialysis
    b. 

Date: 08/06/2022

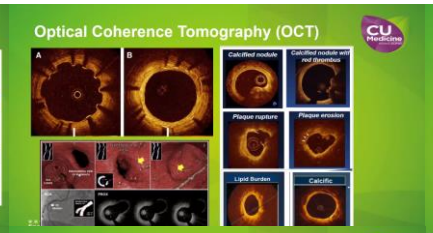
Session: Department of Medicine and Therapeutics – Division of Cardiology

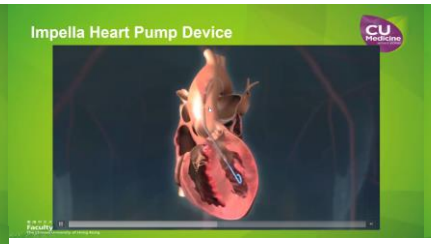
1. Development and advances in percutaneous coronary intervention
    a. Lecturer outlined how angioplasties are done and discussed the design challenges for stents
    b. 

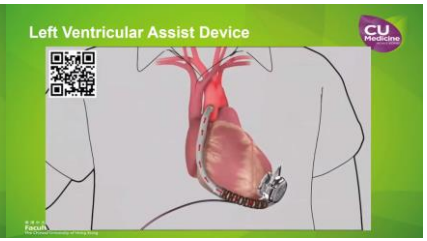
2. Peripheral, venous and structural interventions
    a. Lecturer discussed imaging techniques used to assess stent performance as well as introduced numerous operation techniques

b.


Intravascular Ultrasound


Optical Coherence Tomography (OCT)
A
B
Calcified nodule
Plaque rupture
Plaque erosion
Lipid Burden
Calcific


Impella Heart Pump Device

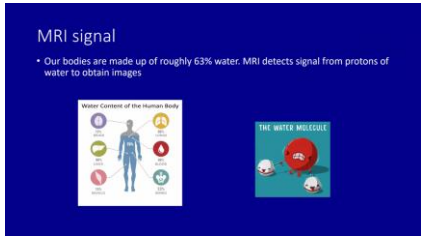

Left Ventricular Assist Device

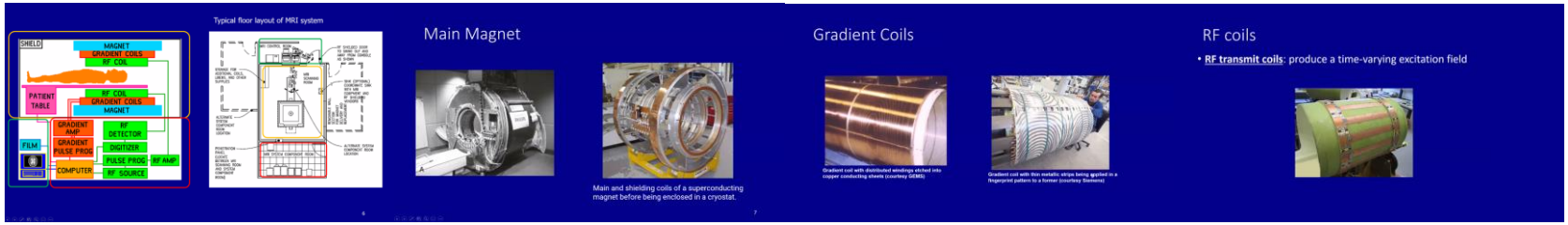

Septal Defect Closure


MitraClip Device

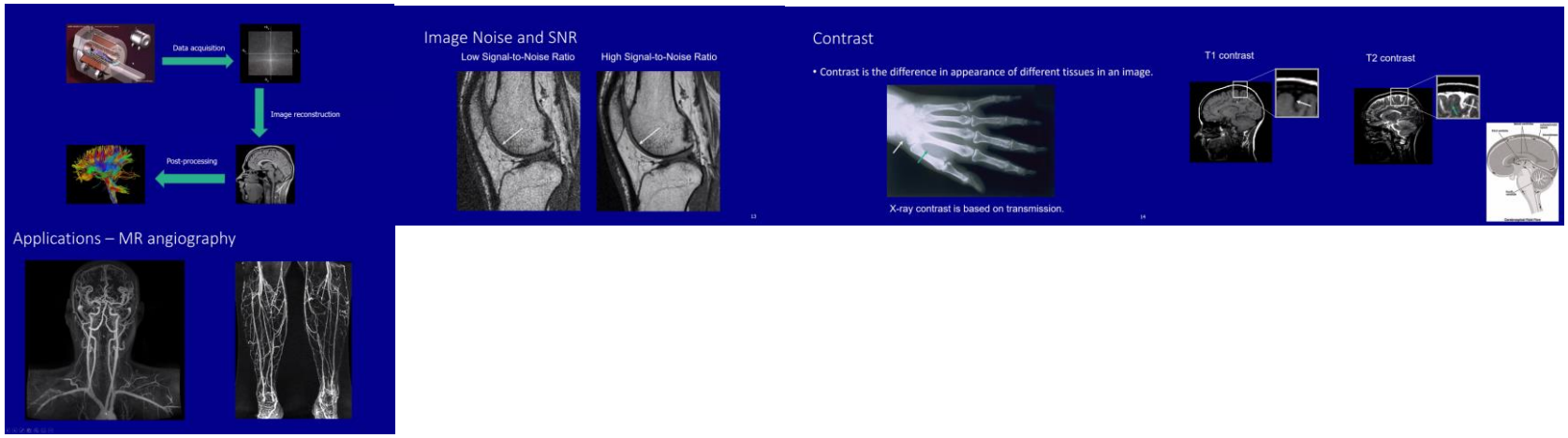
Date: 08/06/2022

Session: Department of Imaging and Interventional Radiology

1. Physics of MR Imaging
    a. Lecturer briefly discussed the rationale for MR imaging
    b. 

2. Components of an MRI scanner, procedures for performing an MRI scan
    a. Lecturer went through each component of an MRI scanner
    b. 

3. Principle of reading MRI images
    a. Lecturer breifly outlined the image acquisition from raw MRI data and discussed how the imaging can be tweaked to highlight different tissues

b. 

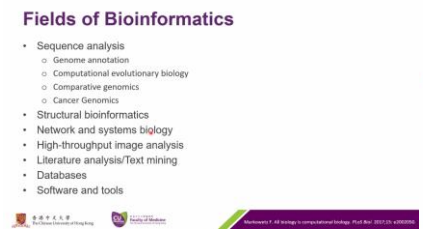
4. Concept of Interventional radiology
    a. Lecturer discussed the use of real-time imaging to guide catheters

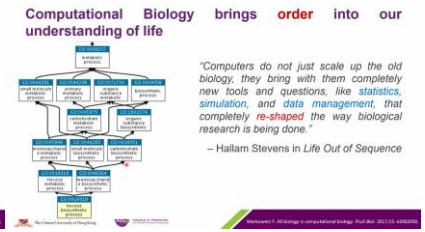
b. 

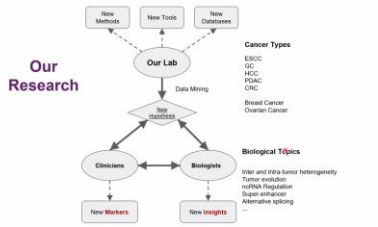
/

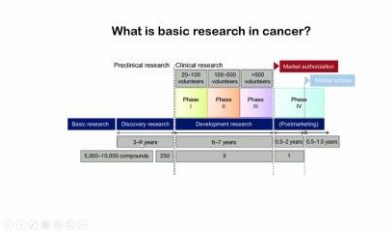
Date: 08/06/2022

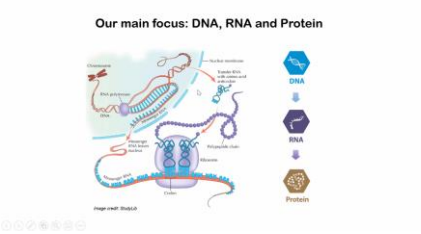
Session: Department of Srugery

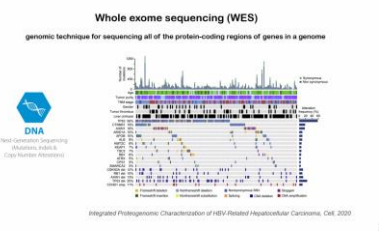
1. Cancer and bioinformatics
    a. Lecturer introduced what bioinformatics is and its sub-fields, as well as how it aids in new researches and discoveries
    b. 

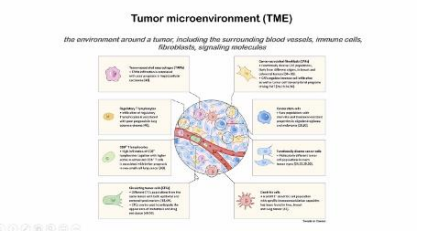


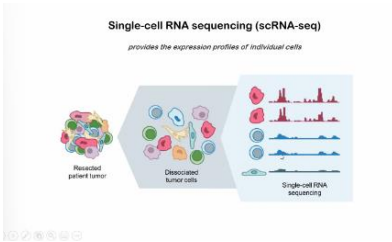


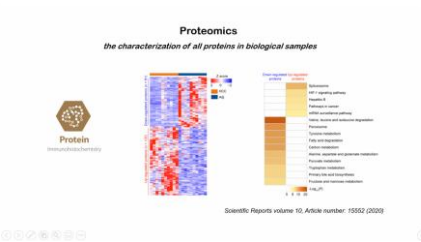
    c. Lecturer outlined the efforts and time neceesary for drug research, as well as outlined the common procedures taken for cancer gene reserach
    d. 

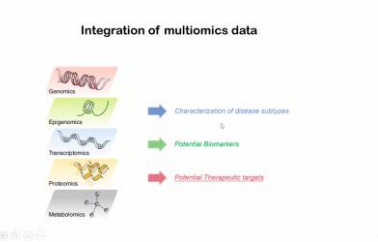


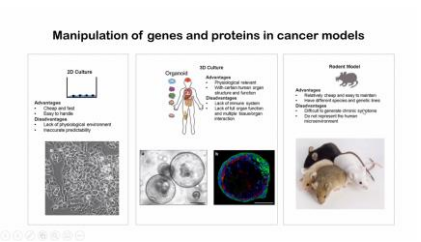


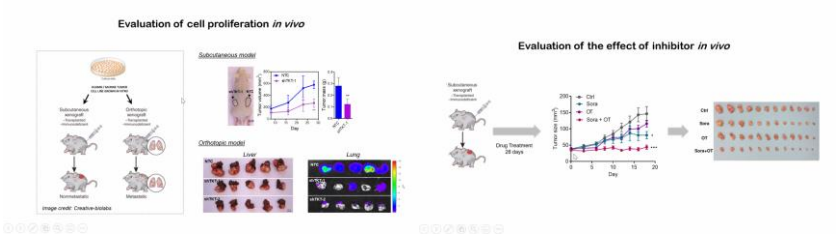


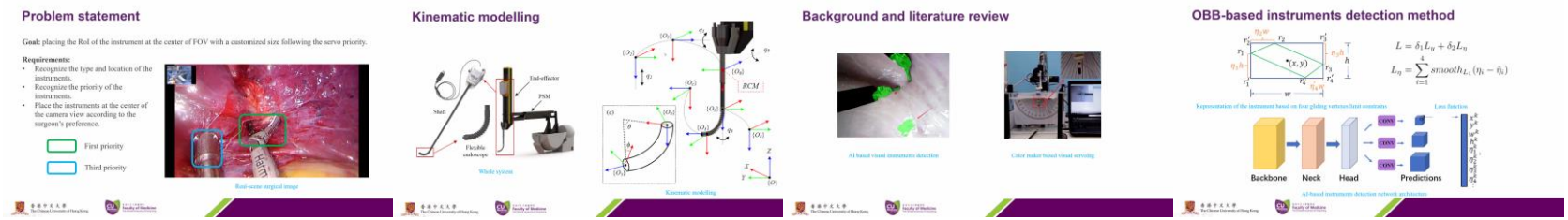








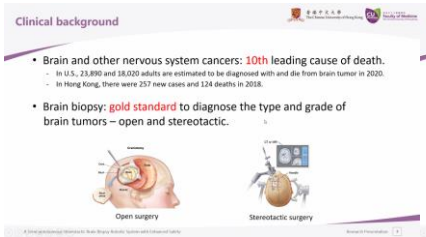


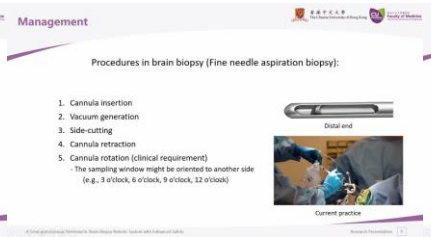
2. Medical robot
    a. Lecturer introduced the challenges of endoscopic robots and the robotic designs and machine learning that can tackle them
    b. 

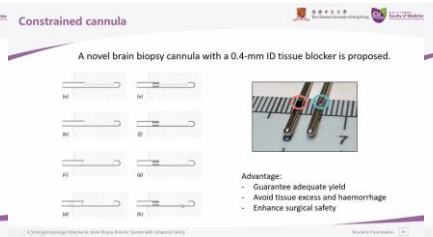
    c. Lecturer discussed the current accuracy requirement for colonoscopy and designs that can ease and automate the procedure
    d. 

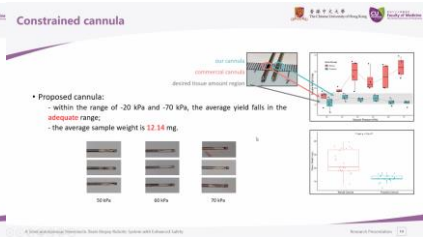
e. Lecturer introduced a brain biopsy robotic system and its advantages over traditional brain biopsy, as well as their design iteration process

f.



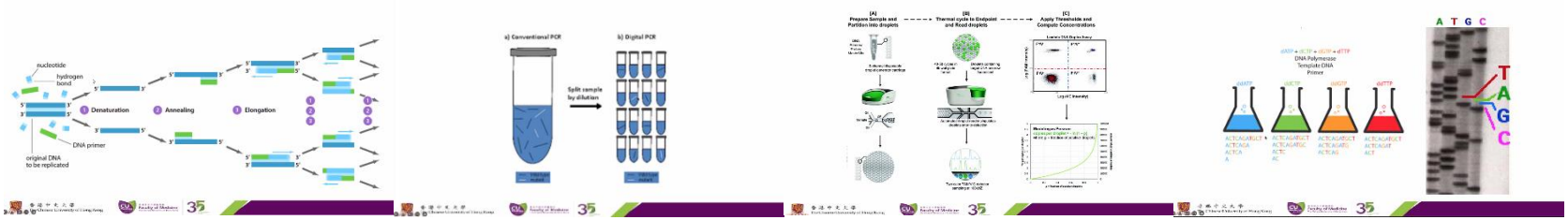


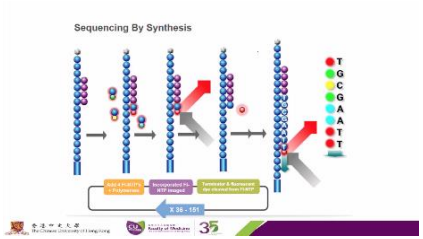


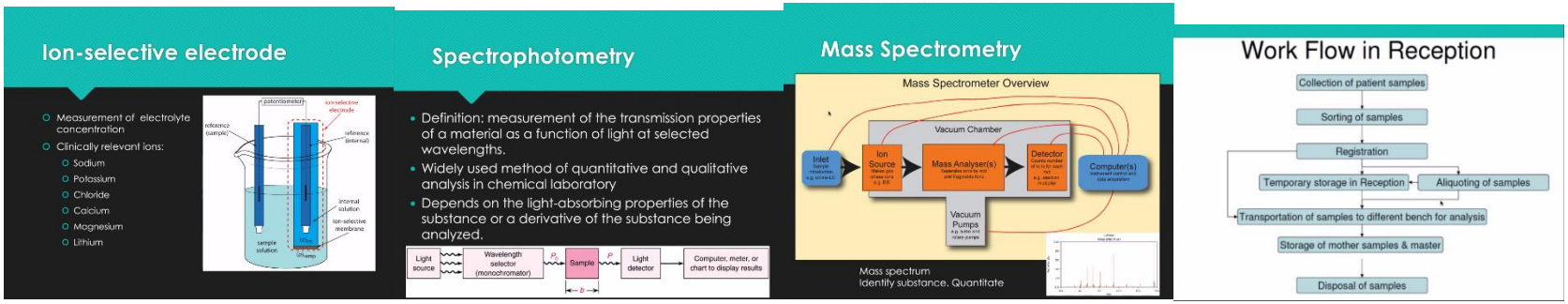


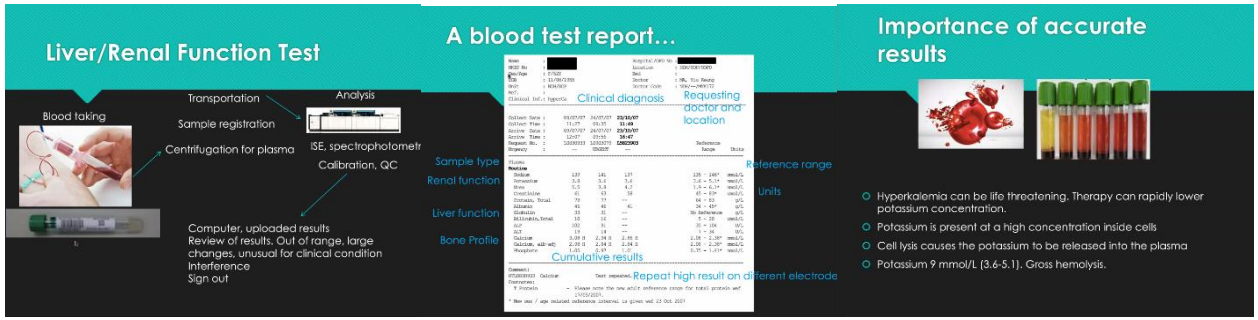
Date: 10/06/2022

Session: Department of Chemical Pathology

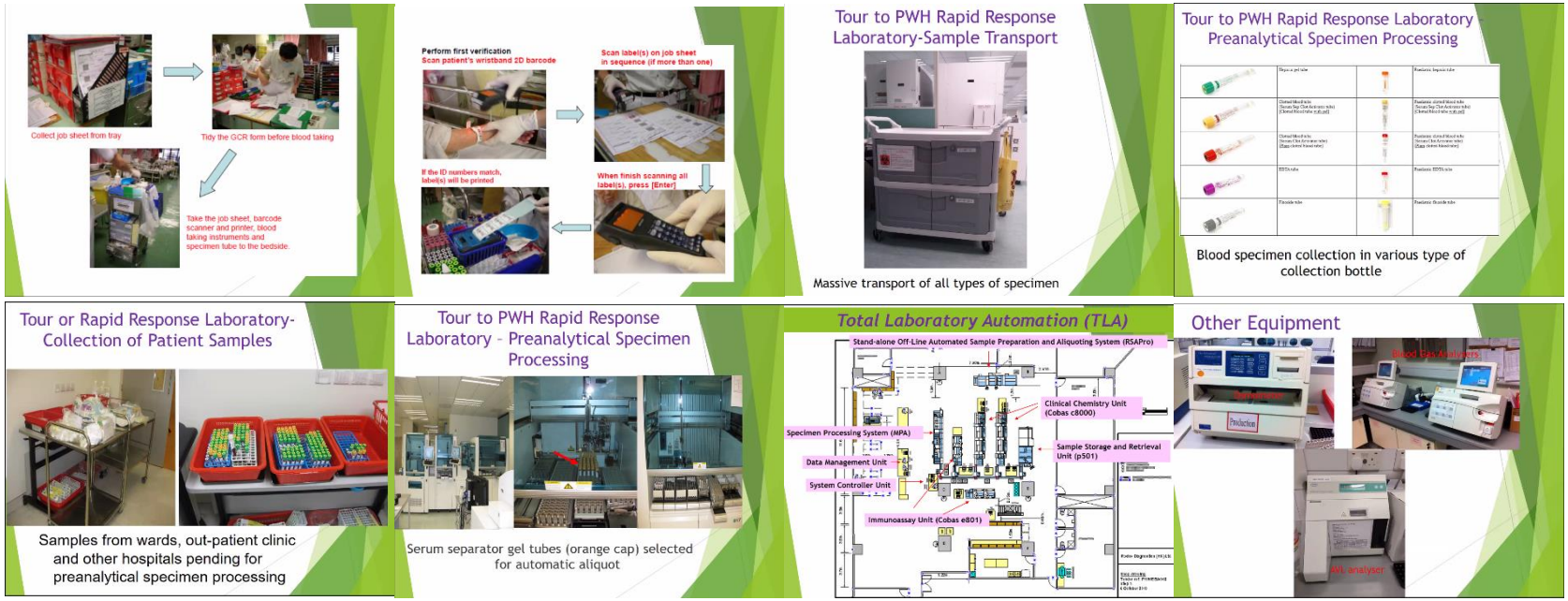
1. Principles of genomic analysis platforms
    a. Lecturer discussed the rationale for genomic analysis
    b. 



2. Chemical Pathology
    a. Lecturer outlined the commone procedures done by chemical pathology department
    b. 



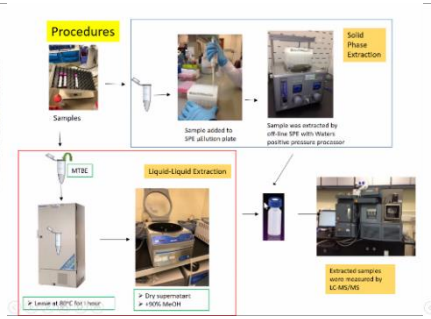
3. Rapid response laboratories
    a. Lecturer described what the stations of a rapid response laboratory do respectively
    b.

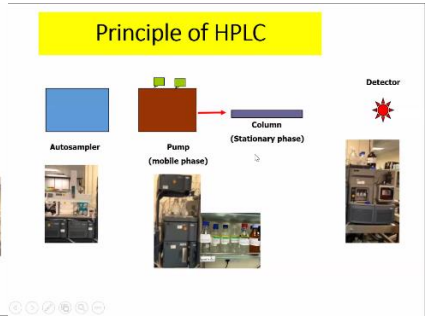


4. Mass spectrometry
    a. Lecturer outlined how mass spectrometry can be used to identify tissues and chemicals in a sample

b.

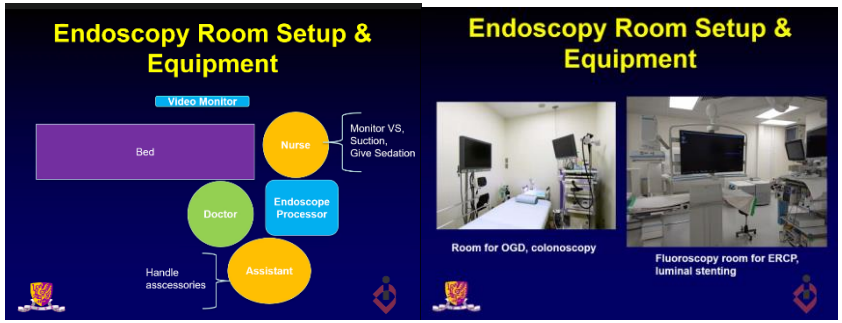

Biomedical Mass Spectrometry Unit(BMSU),
Chemical Pathology, PWH
3 major sections
- Routine Service : 6 LC-MS/MS
- Toxicology and Protein :2 LC-TOFMS
- Pharmacokinetic laboratory :
2 LC-MS/MS

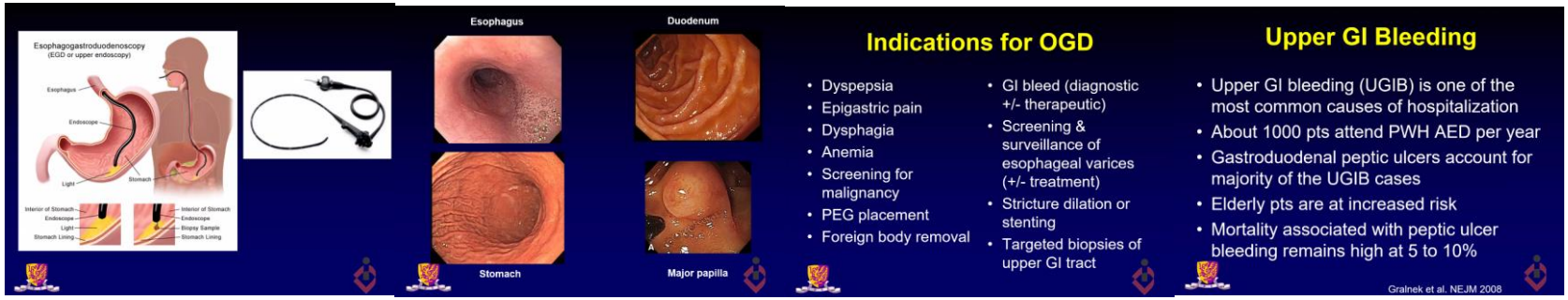

Procedures
Samples
Solid Phase Extraction
MTBE
Liquid-Liquid Extraction

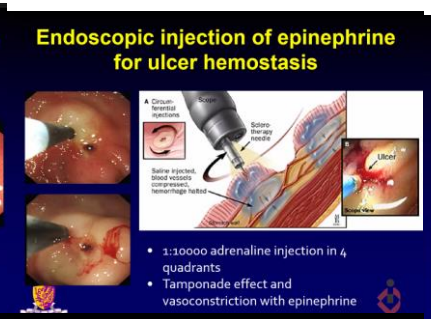

Principle of HPLC
Autosampler
Pump
(mobile phase)
Column
(Stationary phase)
Detector

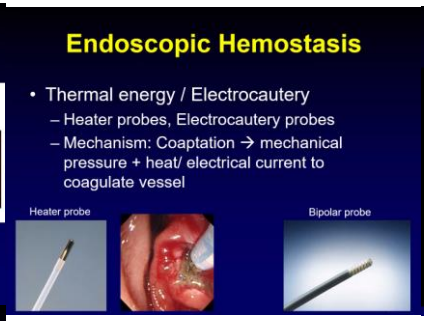
Date: 10/06/2022

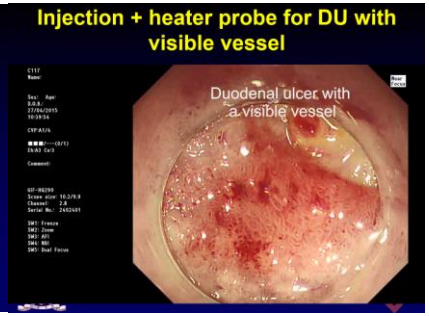
Session: Department of Medicine and Therapeutics – Division of Gastroenterology & Hepatology

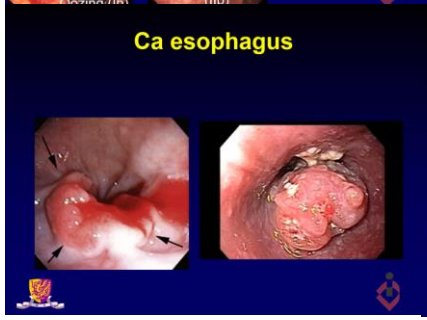
1. Endoscopy room
    a. Lecturer introduced the layout and facilities of an endoscopy room
    b. 

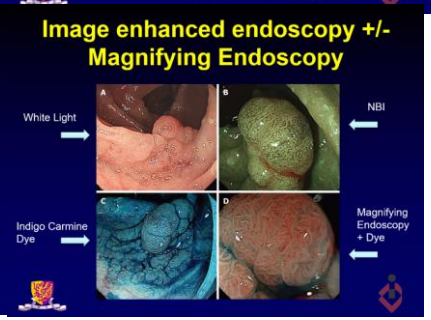
2. Oesophago-gastro-endoscopy
    a. Lecturer introduced the uses of OGE as well as different types of GI bleeding and their treatments
    b. 







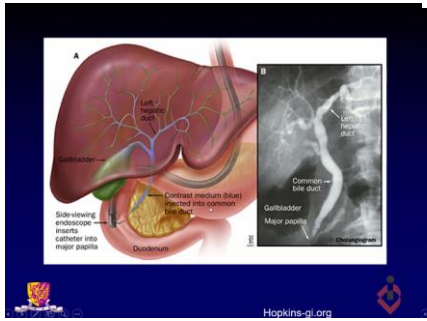


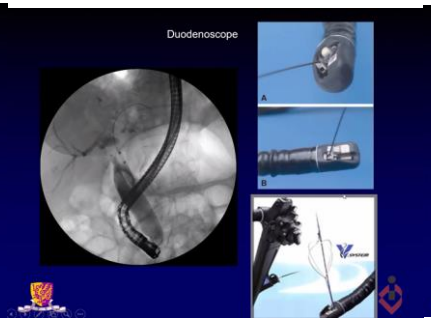


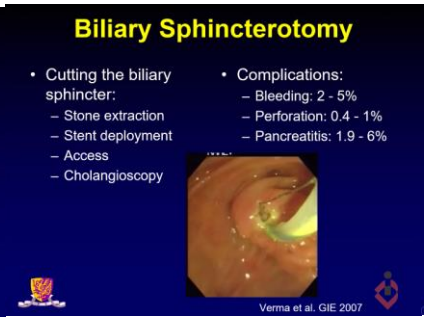
3. Endoscopic Retrograde Cholangiopancreatography

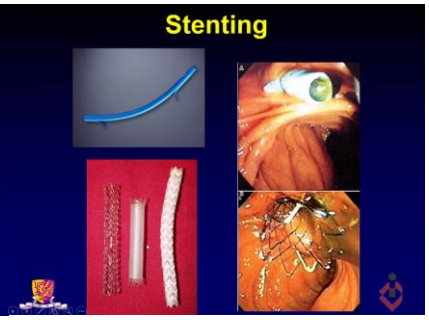
    a. Lecturer outlined how this technique can be used to stent blocked ducts or remove tumor tissues as well as introduced new robotic systems

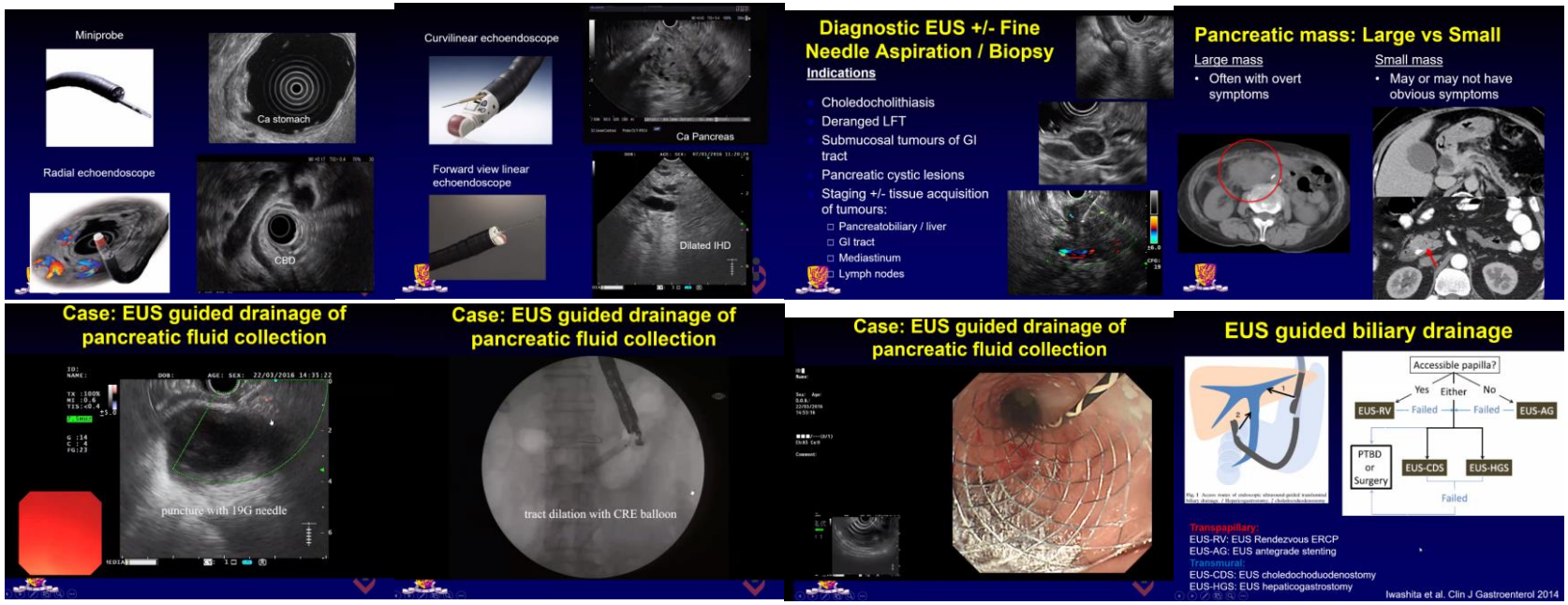
    b.





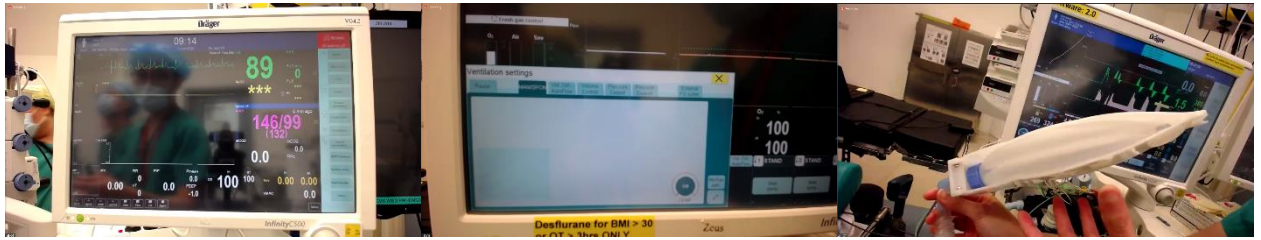


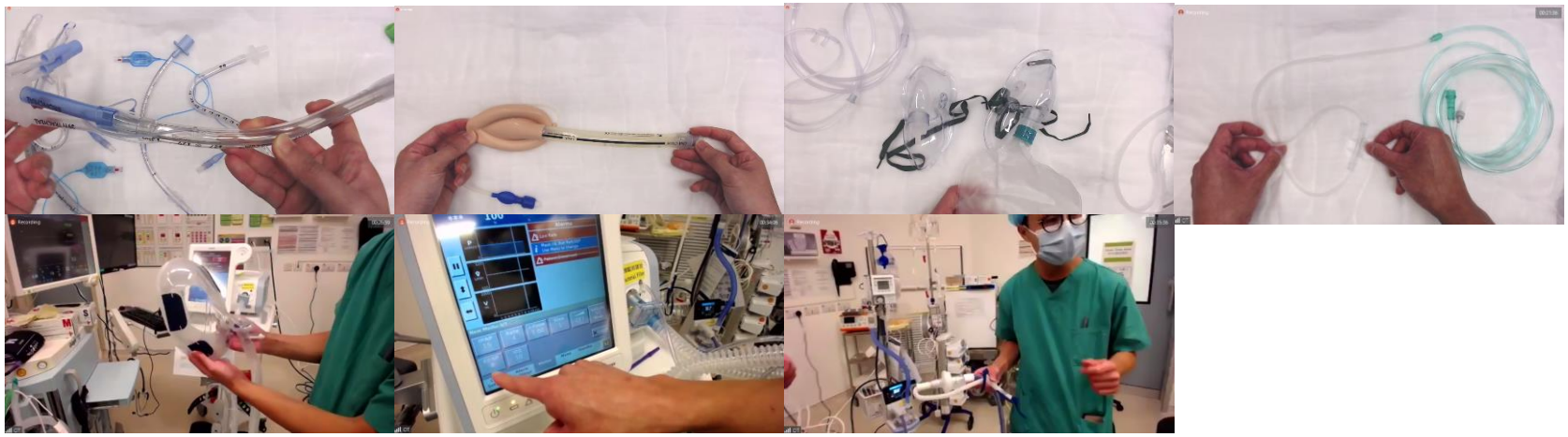


4. Endoscopic ultrasound
    a. Lecturer discussed how this technique can be used to provide how-resolution insights into the GI ducts to guide operations
    b. 

Date: 11/06/2022

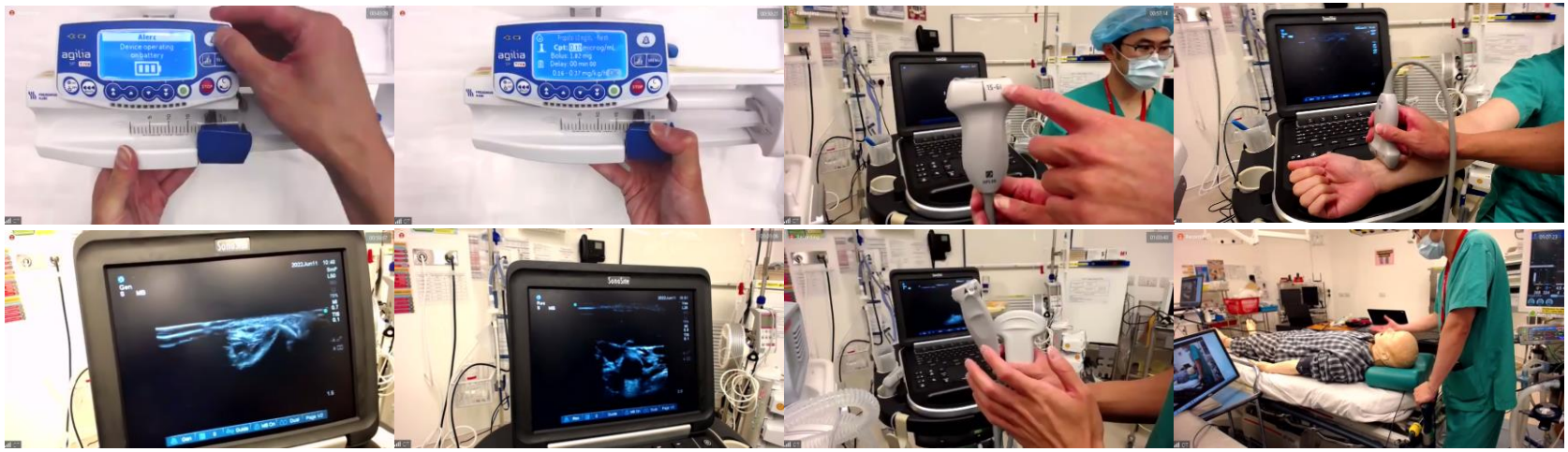
Session: Department of Anaesthesia and Intensive Care

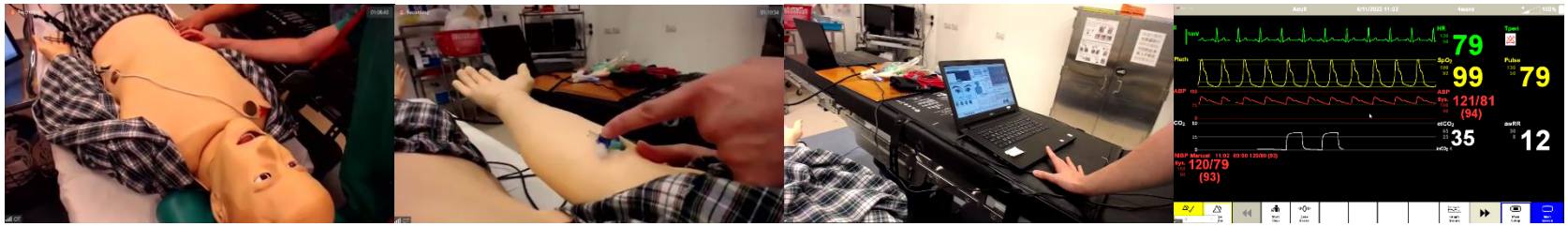
1. Anaesthetic machine
    a. Lecturer introduced the basic functionalities of anaesthetic machines
    b. 
2. Monitors
    a. Lecturer introduced some vitality monitors as well as some scopes that can show airway obstructions
    b. 
3. Ventilators
    a. Lecturer introcued different types of ventilator masks and their capabilities, as well as an air warmer and humidifier

b. 

4. Accessories

    a. Lecturer introduced the syringe pump, ultrasound machine, and simulator dummy

    b. 


HR
79
SpO2
99
121/81
(94)
Pulse
79
35
12
120/79
(93)