

PWH/CUMC Training Log Book

1155174356 Chan Cheuk Ka

Date: 01/06/2022

Session: Department of Orthopaedics and Traumatology

1. Computer-aided orthopaedic surgery

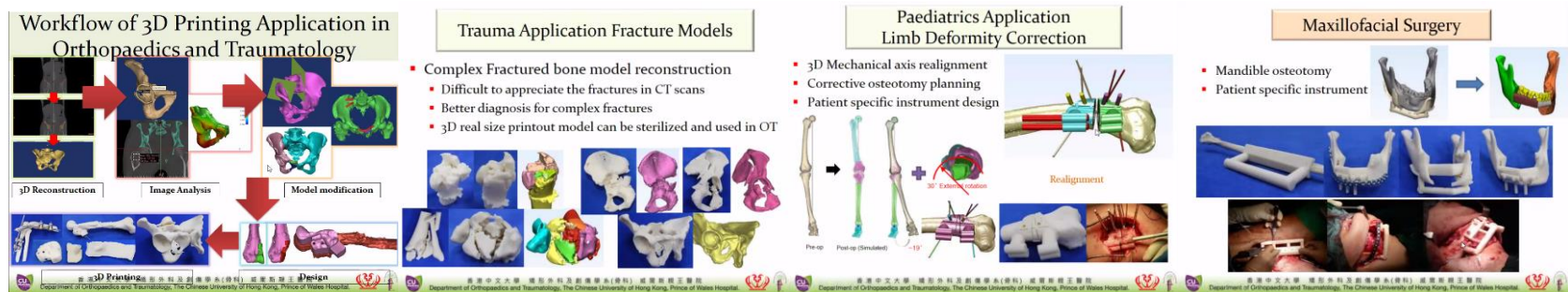
- a. Lecturer introduced the uses of real-time scanning (surgical navigation) during surgery to increase accuracy for implantation



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

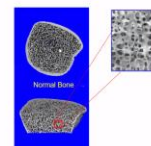
Clinical Bone Densitometry

- DXA (Dual energy X-ray Absorptiometry)
 - Assessing bone mineral density
 - Diagnosis for osteoporosis (by WHO)
- HR-pQCT (High resolution peripheral QCT)
 - Assessing bone microarchitecture (*in vivo*)
 - Monitor the changes in volumetric BMD, trabecular microarchitecture

Spine and Hip

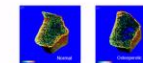


HR-pQCT Images



micro Finite Element Analysis (μFEA)

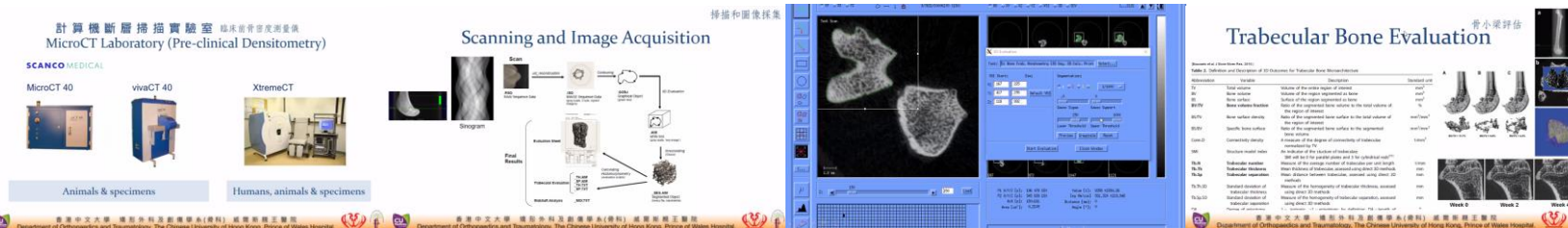
- Computational simulation technique
 - Investigate the mechanical properties of bone
- For HR-pQCT (XtremeCT)
 - Using SCANCO FE-solver in Image Processing Language (IPL) software
 - Validated by *in vitro* studies
 - FE Parameters:
 - Stiffness (N/mm)
 - Est. Failure Load (N)



b.

4. MicroCT / VivaCT, digital x-ray for small animals

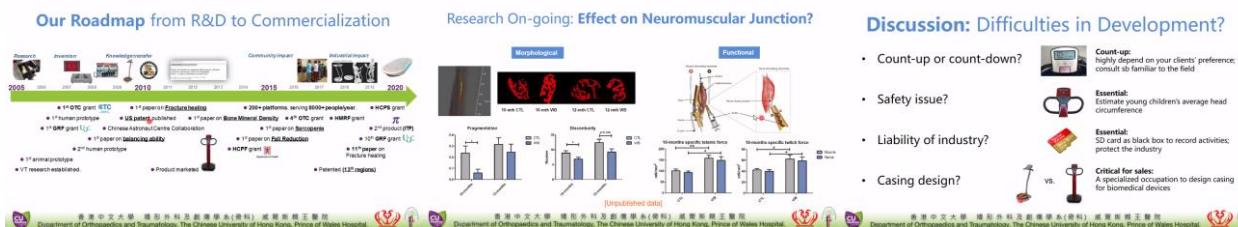
a. Lecturer introduced the use of MicroCT to produce a fine detailed 3D model of bone for bone micro-architecture evaluation



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

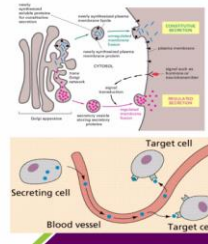
Session: Department of Medicine and Therapeutics - Division of Endocrinology & Diabetes

1. Principles of endocrine disorders and common endocrine conditions

- a. Lecturer helped us revise some important concepts of the hormonal system

Hormone Synthesis and Action

- synthesized within the cells and stored in special packets (called granules)
- secreted from cell into capillaries
- Distributed via capillaries to target cells
- Target cells have receptors for the hormone
- Hormone may stimulate or inhibit cellular functions after binding to receptors
- Target organ may secrete hormone that feeds back information to endocrine cells



b.

2. Glucose homeostasis, hyperglycaemia, diabetes and complications, care

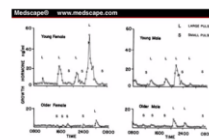
- a. Lecturer outlined the clinical procedures to the diagnosis for diabetes and precautions necessary to prevent mis-diagnosis

Clinical approaches



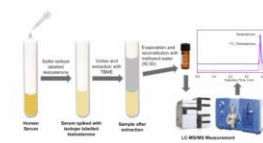
b.

Pulsatile secretion and dynamic tests



- Hormones often secrete in a pulsatile manner
- High or low levels may be physiological or pathological
- Blood levels at any one time point may be misleading
- Stimulation test used to exclude deficiency
- Suppression test used to exclude over-secretion

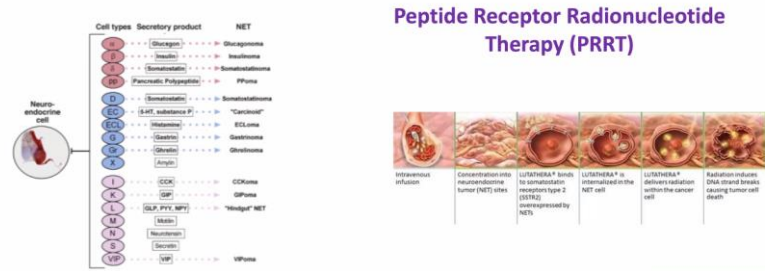
LC-MS/MS measurement of Testosterone



- Benefits**
- Detection at much lower limits
 - Can differentiate between isoforms
 - Of other hormones

3. Examples of technology facilitating endocrine care

- a. Lecturer introduced different types of treatment for neuroendocrine tumour

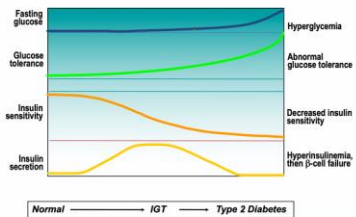


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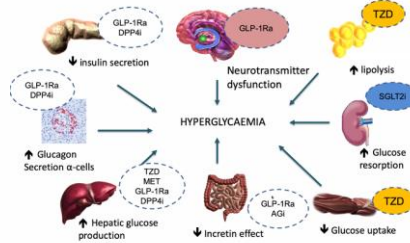
4. Examples of technology facilitating diabetes care

a. Lecturer explained the diabetes types and their development as well as the suitability of different treatment approaches

Development of Type 2 diabetes

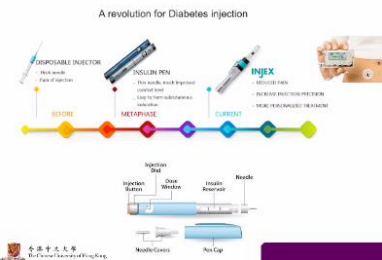


Pathogenesis of Hyperglycaemia in Type 2 DM



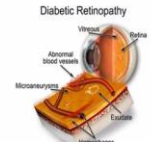
Adapted from DeFronzo RA, Diabetes 2009; 58: 773

Evolution of insulin delivery



Natural History of Diabetic Retinopathy

- Two categories:
 - No proliferative (NPDR)
 - Proliferative (PDR)
- NPDR further classified as mild, moderate, severe
- Diabetic macular edema (DME) can develop in both NPDR and PDR
- Uncontrolled growth of new blood vessels (neovascularization) and DME are the primary causes of vision loss in both type 1 and type 2 diabetes
- Hence needs regular screening- Annual, then Q 1-2yrs if normal



b.

Date: 01/06/2022

Session: Department of Medicine and Therapeutics - Division of Rheumatology

1. Rheumatological diseases and osteoporosis

a. Lecturer introduced a few cases of rheumatological patients and their treatments

Gout (痛風)

- Hyperuricemia results in deposition of monosodium urate crystals
- Peak age of onset: 40-50 years old (males) and >60 years old (female)
- Abrupt onset, monoarticular, occur during the night or early morning when the joint is coolest
- Painful, warm, red and swollen joints
- Risk factors: Obesity, Alcohol, bleeding, exercise, drugs, high purine diet, fructose drink ingestion, renal impairment, dehydration

Case presentation III

- 20 years old, Claudia, a year 3 University student, good past health
- Complains of multiple small hand joints pain and swelling
- Also noted facial rash, photosensitivity, foamy urine

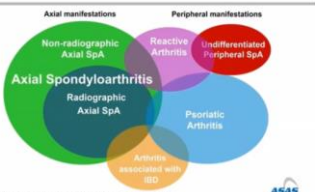


b. 

2. SpA

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

Spondyloarthritis (SpA)



Modified from Proft F et al. The Axis Musculoskeletal (2019) 10: 129-39

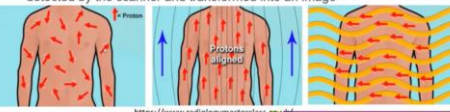
X-Ray Radiograph



Figure 4. Radiographic representation of the evolution of spondyloarthritis. Top left: normal AX spine. Top right: spondyloarthritis (SpA) with irregularity and erosion of articular surfaces, with preserved vertebral body. Bottom left: late SpA with complete ankylosis and loss of vertebral body. Bottom right: late SpA with complete ankylosis.

Magnetic Resonance Imaging (核磁共振)

- MRI images are a map of proton energy within tissue of the body
- Produces repeating sequences of radiofrequency pulses to 'excite' protons in the body
- As protons in the body 'relax' they give off radiofrequency 'signal' which is detected by the scanner and transformed into an image



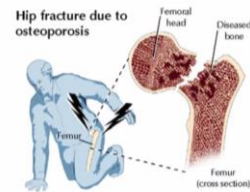
<https://www.radiologymasterclass.co.uk/>

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

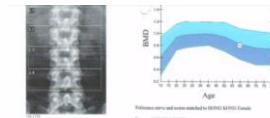
Bone fracture



BMD and body composition in a piece bone by DXA

Region of Interest (ROI)	Decalified
Total weight (g) (A+B)	10.841
BMC (g) (A)	0.202
BMD (mg/cm ²)	71.662
Soft weight (g) (B)	10.638
Lean weight (g)	4.807
Fat weight (g)	5.831

DXA weight (g) = BMC + Lean + Fat



DXA Results Summary:

Region	Area (cm ²)	BMC (g)	BMD (g/cm ²)	T-Score	Z-Score
L1	13.04	8.72	0.669	-2.1	-0.4
L2	14.09	10.87	0.771	-1.9	-0.3
L3	16.21	13.82	0.853	-1.5	-0.1
L4	17.24	15.26	0.886	-1.2	-0.1
Total	60.58	48.67	0.803	-1.7	-0.2

Total BMD CV 1.0%
WHO Classification: Osteopenia
Fracture Risk: Increased

1. NextGen Sequencing NGS: gene-gene region interactions
2. Proteomics: Protein structure
3. Bioinformatics: Math models and tools to deduce these relationship.
4. Biotechnologist: Application



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

HR-pQCT

- "High-resolution peripheral quantitative computer tomography"
- Detection of bone changes typically achieved by conventional XR
- HR-pQCT: a novel 3-dimensional imaging technique for detailed bone microstructure analysis
- higher sensitivity in detecting bone erosions compared with other imaging modalities and regarded as the gold-standard investigation tool
- capable of offering high-throughput, low radiation and high isotropic resolution (61 µm) imaging of the peripheral sites

Erosion healing

Repair of bone erosions in rheumatoid arthritis treated with tumour necrosis factor inhibitors is based on bone apposition at the base of the erosion

Stephane Trépo, Jorgens Ruch, Sarah Schmitt, Klaus Engelke, Mathieu Engelke, Christiane Dack, Yung Chien

Erosion healing

Comparison of the effects of tocilizumab monotherapy and adalimumab in combination with methotrexate on bone erosion repair in rheumatoid arthritis

Stephane Trépo, Jorgens Ruch, Sarah Schmitt, Klaus Engelke, Mathieu Engelke, Christiane Dack, Yung Chien

Identification and Quantification of new bone formation

GIOP

b.

Date: 02/06/2022

Session: CU Medical Centre Training

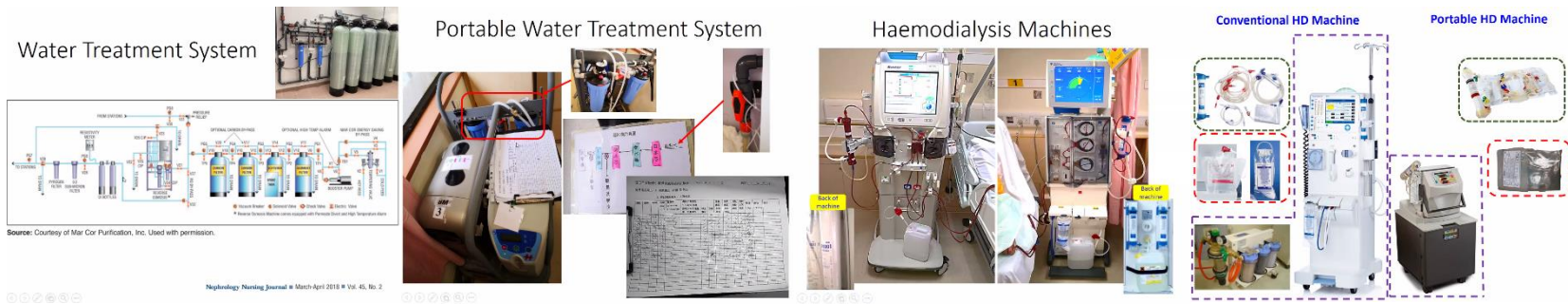
1. Live ACL reconstruction surgery
 - a. We had the opportunity to watch a live ACL reconstruction surgery done by the doctor. It was a minimally invasive surgical operation. The doctor first made three small incisions; he then extracted two tendons from the hamstrings and stitched them together to form 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

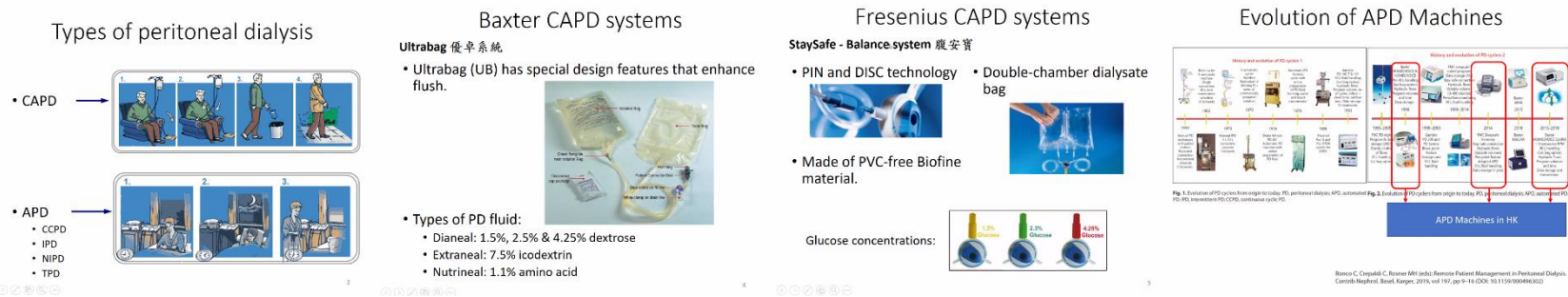
- a. Lecturer introduced the complementary facilities and machines necessary for haemodialysis



b. 00000000

2. Peritoneal dialysis

- a. Lecturer briefly introduced different designs for peritoneal dialysis



b. 00000000

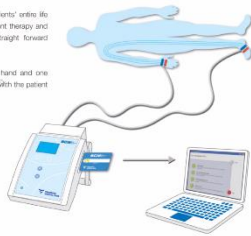
3. Body composition measurement, Pulse velocity measurement

- a. Lecturer briefly introduced these measurement metrics

Body Composition Measurement

Application is possible during the patients' entire life cycle from CKD 1 to renal replacement therapy and transplantation⁷. Handling is very straight forward involving:

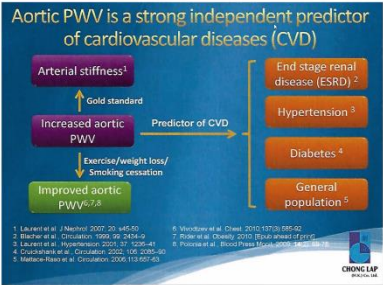
- Placement of electrodes on one hand and one foot at the same side of the body with the patient in a supine position
- Connection of the patient cable
- Entry of height and weight
- Initiation of measurement
- Results are available within 2 min and are stored on a PatientCard automatically. Data can be transferred via the PatientCard to the Fluid Management Tool (FMT) for further analysis.



b.

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 "Y" for dialysis dose assessment		
... measures non-invasively, rapidly with easy application		
Key parameters		Unit
Overhydration (OH) (pre-dialysis)		[L]
Lean tissue index (LTI)		[kg/m ²]
Fat tissue index (FTI)		[kg/m ²]
Total body water (TBW)		[L]
Extracellular water volume (V _e)		[L]
Intracellular water (ICW)		[L]
ICW / ICW		-
Lean tissue mass		[kg] and [%]
Fat mass		[kg] and [%]
Adipose tissue mass		[kg]
Body Cell Mass		[kg]



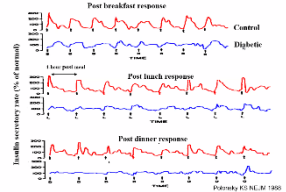
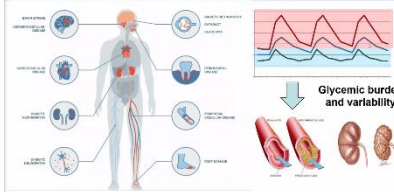
Date: 06/06/2022

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

1. Diabetes

a. Lecturer briefly introduced the definition of diabetes

b.

Glucose and fat (FFA) as energy substrates	Glucose sensing and insulin release Loss of pulsation in insulin secretion in type 2 diabetes	Optimal internal environment to protect structure and maintain function
• Insulin has multiple actions – Only hormone that can lower blood glucose – Promotes glucose entry to the cells for consumption – Stimulates storage as glycogen (in liver and muscle) and fat – Suppresses excessive breakdown of fat • Glucose is a normal fuel with water and CO₂ as waste products • Use of fat (fatty acids) as alternative fuel generates ketones, an acid, which is health-damaging • Lack of carbohydrate intake (e.g. starving) or excessive fat burning without adequate insulin action or lack of insulin action can lead to ketosis	 Paradee EO H.C.M. 1995	 Glycemic burden and variability

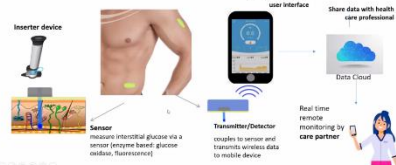
2. Continuous glucose monitoring and insulin infusion system

a. Lecturer briefly introduced 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.

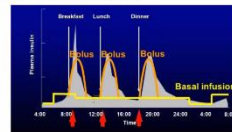
Continuous glucose monitors (CGM)

Non-invasive minute-to-minute measurement of glucose



Insulin pumps

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



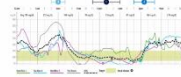
Types of CGM

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 Pro 2



Standalone insulin pump



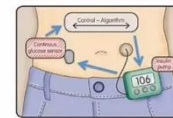
Issues and challenges with CGMs

- 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



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 [Lewinsohn Diabetes Registry Network 2015](#)
- Pump does not do it all
 - Still need to perform hxix
 - Automode vs retaining control of BG
 - Physicality of having a device attached all the time

Choice of pumps



Patch pumps



Pod holds 200 units insulin
Change every pod every 2-3 days

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



2. Electrical safety tester

a. Lecturer introduced the different classes and categories of protective equipment and to what extent they are rated to protect



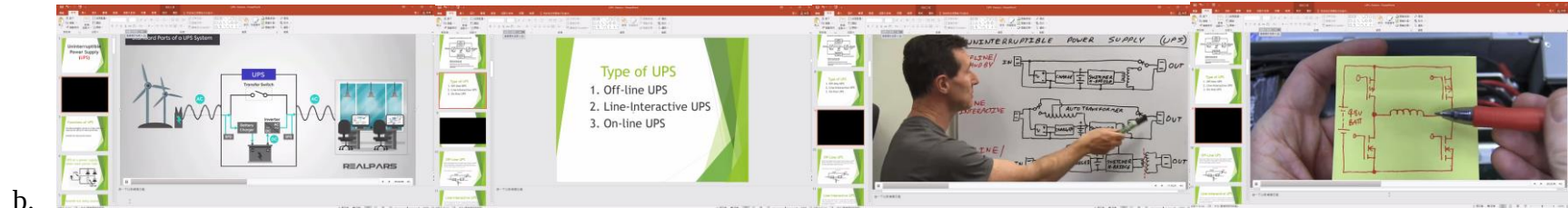
3. Infusion pump and tester

a. Lecturer outlined the uses of infusions pumps and ways to test and calibrate their functionality



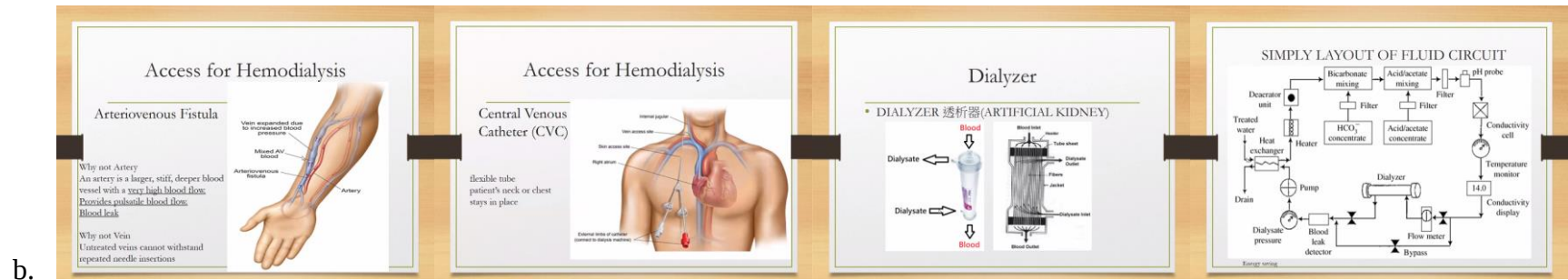
4. Uninterruptible power supply

- 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



5. Haemodialysis unit

- a. Lecturer introduced the considerations for blood vessel choice and the rationale for haemodialysis



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

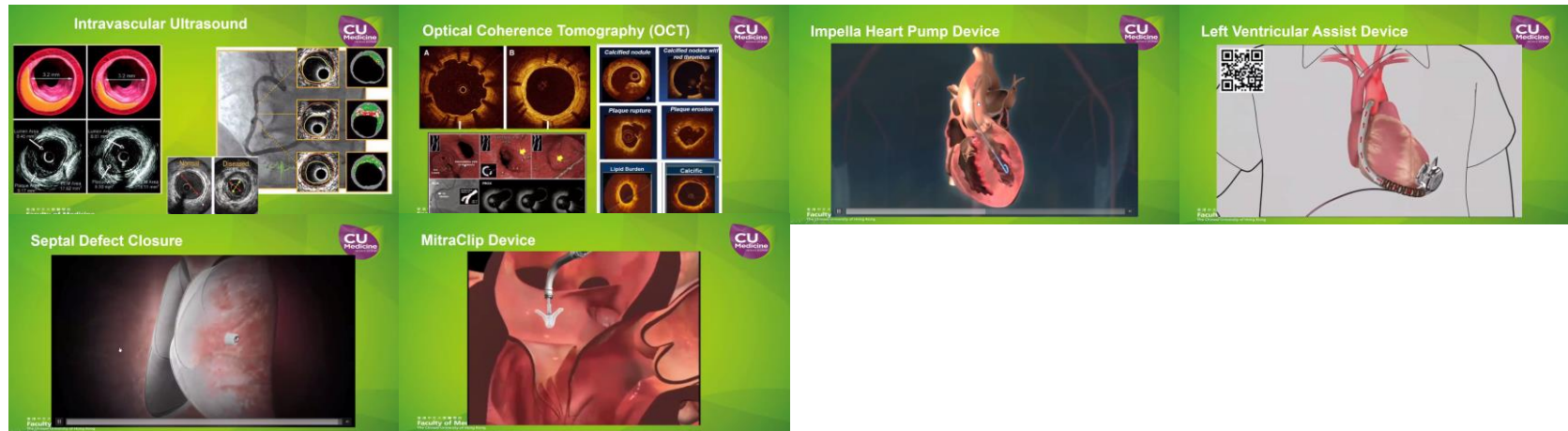
b.



2. Peripheral, venous and structural interventions

a. Lecturer discussed imaging techniques used to assess stent performance as well as introduced numerous operation techniques

b.

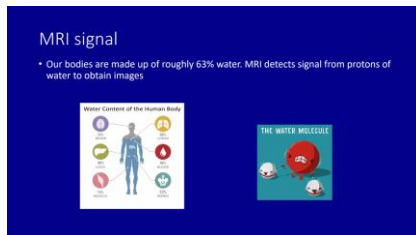


Date: 08/06/2022

Session: Department of Imaging and Interventional Radiology

1. Physics of MR Imaging

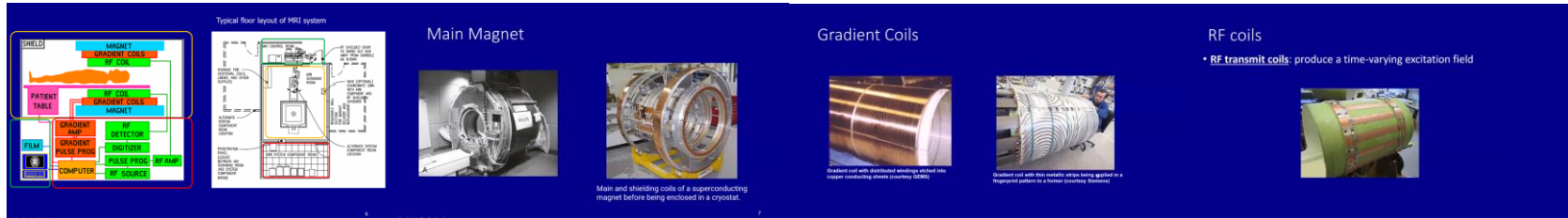
- a. Lecturer briefly discussed the rationale for MR imaging



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 briefly outlined the image acquisition from raw MRI data and discussed how the imaging can be tweaked to highlight different tissues

b.

Data acquisition

Image reconstruction

Post-processing

Image Noise and SNR

Low Signal-to-Noise Ratio

High Signal-to-Noise Ratio

Contrast

• Contrast is the difference in appearance of different tissues in an image.

X-ray contrast is based on transmission.

T1 contrast

T2 contrast

Applications – MR angiography

4. Concept of Interventional radiology

a. Lecturer discussed the use of real-time imaging to guide catheters

b.

Interventional Radiology
(Imaging Guided Therapy)

Interventional radiology: Minimally invasive procedures are performed using image guidance. Images are used to direct these procedures, which are usually done with needles or other tiny instruments like small tubes called catheters. The images provide road maps that allow the doctors to guide these instruments through the body to the areas of interest.

The Society for Ultrasound in Anaesthesia
www.usgan.com

IN LINE NEEDLING - RADIAL NERVE BLOCK

V9 Monitoring the spread of local anesthetics.

V10

Date: 08/06/2022

Session: Department of Surgery

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

Fields of Bioinformatics

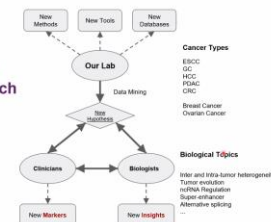
- Sequence analysis
 - Genome annotation
 - Computational evolutionary biology
 - Comparative genomics
 - Cancer Genomics
- Structural bioinformatics
- Network and systems biology
- High-throughput image analysis
- Literature analysis/Text mining
- Databases
- Software and tools

Computational Biology brings order into our understanding of life



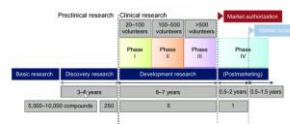
"Computers do not just scale up the old biology; they bring with them completely new tools and questions, like statistics, simulation, and data management, that completely re-shaped the way biological research is being done."
— Hallam Stevens in Life Out of Sequence

Our Research

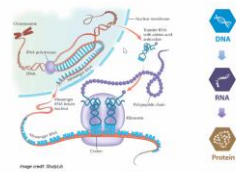


- b.
- c. Lecturer outlined the efforts and time necessary for drug research, as well as outlined the common procedures taken for cancer gene research

What is basic research in cancer?

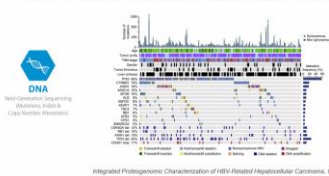


Our main focus: DNA, RNA and Protein



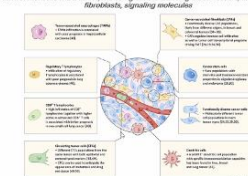
Whole exome sequencing (WES)

genomic technique for sequencing all of the protein-coding regions of genes in a genome



Tumor microenvironment (TME)

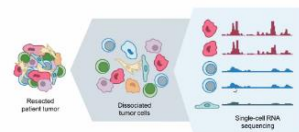
the environment around a tumor, including the surrounding blood vessels, immune cells, fibroblasts, signaling molecules



- d.

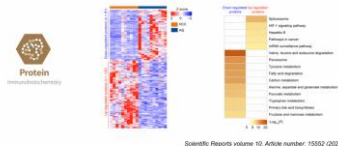
Single-cell RNA sequencing (scRNA-seq)

provides the expression profiles of individual cells

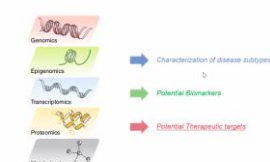


Proteomics

the characterization of all proteins in biological samples

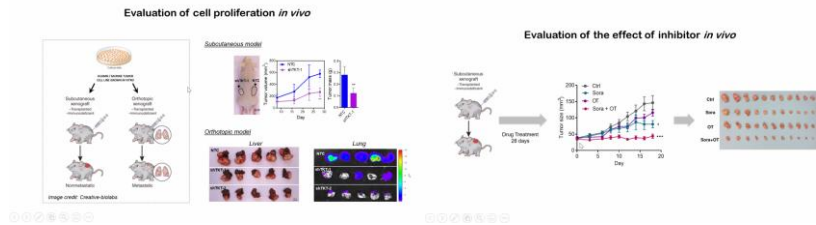


Integration of multiomics data



Manipulation of genes and proteins in cancer models





2. Medical robot

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

Problem statement

Goal: placing the Rot of the instrument at the center of FOV with a customized size following the servo priority.

Requirements:

- Recognize the type and location of the instruments.
- Recognize the priority of the instruments.
- Place the instruments at the center of the camera view according to the surgeon's preference.

First priority
Third priority

Kinematic modelling

Background and literature review

OBB-based instruments detection method

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

Conventional Colonoscopy

- Colonoscopy
 - Gold standard for colon inspection and treatment
- Flexible colonoscopy
 - Most commonly used in clinical practice
 - High accuracy and reliability
 - Limitations
 - Patient discomfort → social acceptance
 - High skill requirement for surgeons → endoscopist source

Proposed solution

- Electromagnetically Actuated Soft-Tethered (EAST) Colonoscope System**
 - Magnetic actuation system
 - Soft-tethered colonoscope
 - Localization unit and control unit
- Objectives**
 - Good patient tolerance
 - Surgeon-friendly manipulation
 - Reliable diagnosis and therapy with high autonomy and efficiency

Small-scale prototype for proof-of-concept

Functionality evaluation

Control evaluation

Automatic trajectory following control

Manual control in a transparent colon mock-up

Polyp Detection & Diagnosis

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

f.

Clinical background

- Brain and other nervous system cancers: **10th** leading cause of death.
 - In U.S., 23,890 and 18,020 adults are estimated to be diagnosed with and die from brain tumor in 2020.
 - In Hong Kong, there were 257 new cases and 124 deaths in 2018.
- Brain biopsy: **gold standard** to diagnose the type and grade of brain tumors – open and stereotactic.




Management

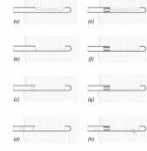
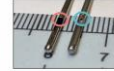
Procedures in brain biopsy (Fine needle aspiration biopsy):

1. Cannula insertion
2. Vacuum generation
3. Side-cutting
4. Cannula retraction
5. Cannula rotation (clinical requirement)
 - The sampling window might be oriented to another side (e.g., 3 o'clock, 6 o'clock, 9 o'clock, 12 o'clock)




Constrained cannula

A novel brain biopsy cannula with a 0.4-mm ID tissue blocker is proposed.

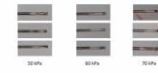
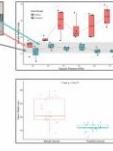
Advantage:

- Guarantee adequate yield
- Avoid tissue excess and haemorrhage
- Enhance surgical safety

Constrained cannula

Proposed cannula:

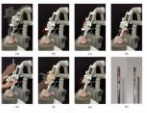
- within the range of -30 kPa and -70 kPa, the average yield falls in the adequate range;
- the average sample weight is 12.14 mg.

Performance validations

Ex vivo experiment

- Overall workflow with the system:
 - a. navigation
 - b. cannula insertion
 - c. vacuum pressure generation
 - d. side-cutting
 - e. sample acquisition
 - f. re-installation
 - g. side window orientation planning
 - h. repeat step 3 and 4 until finish
- Feasibility of the system is verified.




Date: 10/06/2022

Session: Department of Chemical Pathology

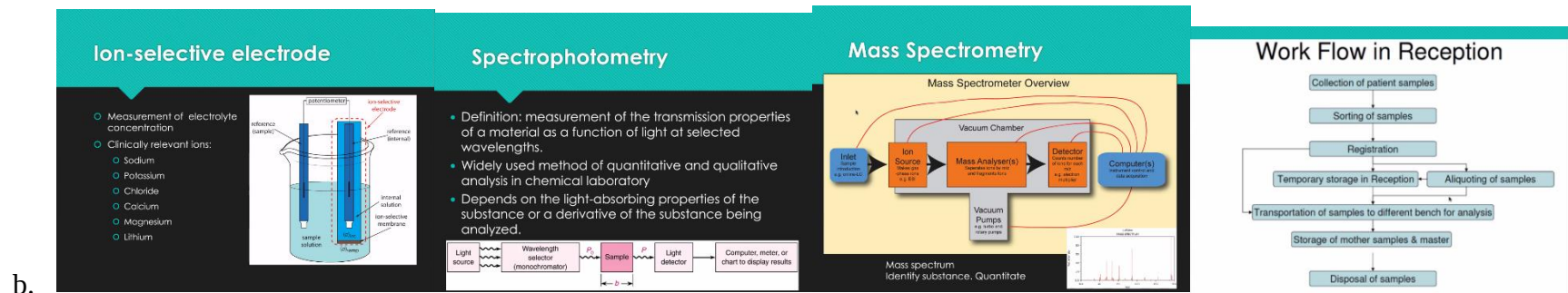
1. Principles of genomic analysis platforms

a. Lecturer discussed the rationale for genomic analysis



2. Chemical Pathology

a. Lecturer outlined the common procedures done by chemical pathology department



Liver/Renal Function Test



Blood taking

Transportation

Sample registration

Centrifugation for plasma

Analysis

ISE, spectrophotometer

Calibration, QC

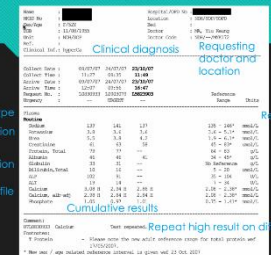
Computer, uploaded results

Review of results. Out of range, large changes, unusual for clinical condition

Interference

Sign out

A blood test report...



Clinical diagnosis

Requesting doctor and location

Reference range

Units

Cumulative results

Sample type

Renal function

Liver function

Bone Profile

Importance of accurate results



- Hyperkalemia can be life threatening. Therapy can rapidly lower potassium concentration.
- Potassium is present at a high concentration inside cells
- Cell lysis causes the potassium to be released into the plasma
- Potassium 9 mmol/L (3.6-5.1). Gross hemolysis.

3. Rapid response laboratories

a. Lecturer described what the stations of a rapid response laboratory do respectively

Tour to PWH Rapid Response Laboratory-Sample Transport



Massive transport of all types of specimen

Tour to PWH Rapid Response Laboratory-Prenatal Specimen Processing



Blood specimen collection in various type of collection bottle

Tour to Rapid Response Laboratory-Collection of Patient Samples



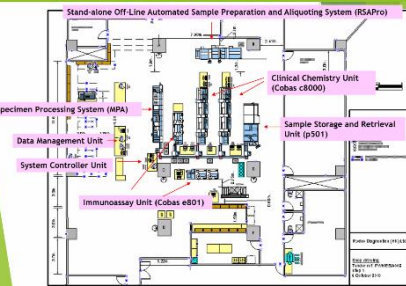
Samples from wards, out-patient clinic and other hospitals pending for preanalytical specimen processing

Tour to PWH Rapid Response Laboratory - Prenatal Specimen Processing



Serum separator gel tubes (orange cap) selected for automatic aliquot

Total Laboratory Automation (TLA)



Other Equipment



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

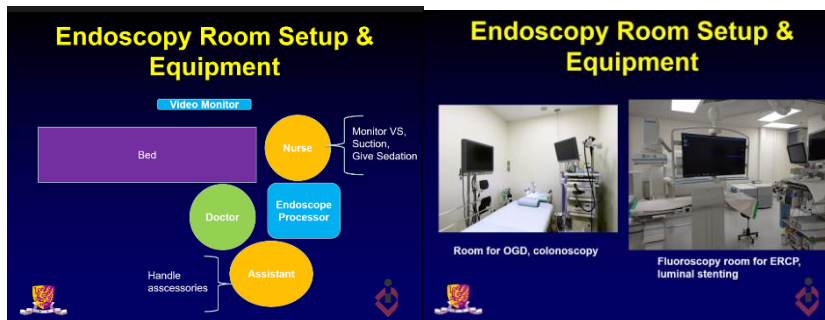
Principle of HPLC

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

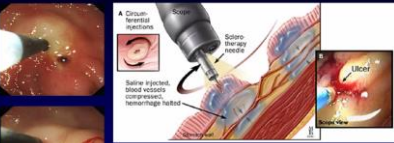
The slide contains several components. On the left is a diagram of "Esophagogastroduodenoscopy (EGD or upper endoscopy)" showing the path of the endoscope through the esophagus, stomach, and duodenum. Below this is a photo of an endoscope. In the center are four endoscopic images: "Esophagus" (top left), "Duodenum" (top right), "Stomach" (bottom left), and "Major papilla" (bottom right). To the right of these images is a section titled "Indications for OGD" with a bulleted list: Dyspepsia, Epigastric pain, Dysphagia, Anemia, Screening for malignancy, PEG placement, and Foreign body removal. Next to it is a section titled "Upper GI Bleeding" with a bulleted list: Upper GI bleeding (UGIB) is one of the most common causes of hospitalization, About 1000 pts attend PWH AED per year, Gastroduodenal peptic ulcers account for majority of the UGIB cases, Elderly pts are at increased risk, and Mortality associated with peptic ulcer bleeding remains high at 5 to 10%. At the bottom right, there is a small citation: "Gralnek et al. NEJM 2005".

b.

Bleeding stigmata: Forrest classification



Endoscopic injection of epinephrine for ulcer hemostasis



- 1:10000 adrenaline injection in 4 quadrants
- Tamponade effect and vasoconstriction with epinephrine

Endoscopic Hemostasis

- Thermal energy / Electrocautery
 - Heater probes, Electrocautery probes
 - Mechanism: Coaptation → mechanical pressure + heat/ electrical current to coagulate vessel



Injection + heater probe for DU with visible vessel



Ca esophagus

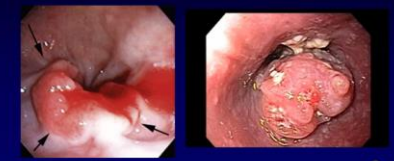
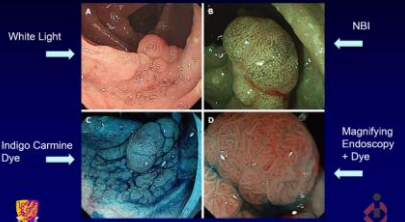


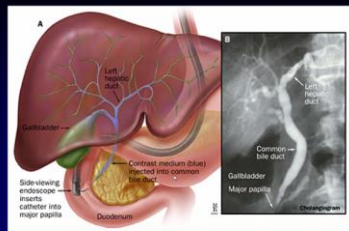
Image enhanced endoscopy +/- Magnifying Endoscopy



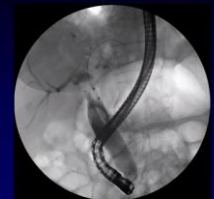
3. Endoscopic Retrograde Cholangiopancreatography

- 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.



Biliary Sphincterotomy


 - Cutting the biliary sphincter:
 - Stone extraction
 - Stent deployment
 - Access
 - Cholangioscopy
 - Complications:
 - Bleeding: 2 - 5%
 - Perforation: 0.4 - 1%
 - Pancreatitis: 1.9 - 6%

Stenting





4. Endoscopic ultrasound

- Lecturer discussed how this technique can be used to provide how-resolution insights into the GI ducts to guide operations

b.

Miniprobe

Radial echoendoscope

Curvilinear echoendoscope

Forward view linear echoendoscope

Ca stomach

CBD

Ca Pancreas

Dilated IHD

Diagnostic EUS +/- Fine Needle Aspiration / Biopsy

Indications

- Cholelithiasis
- Deranged LFT
- Submucosal tumours of GI tract
- Pancreatic cystic lesions
- Staging +/- tissue acquisition of tumours:
 - Pancreatobiliary / liver
 - GI tract
 - Mediastinum
 - Lymph nodes

Pancreatic mass: Large vs Small

Large mass

- Often with overt symptoms

Small mass

- May or may not have obvious symptoms

Case: EUS guided drainage of pancreatic fluid collection

puncture with 19G needle

Case: EUS guided drainage of pancreatic fluid collection

tract dilation with CRE balloon

Case: EUS guided drainage of pancreatic fluid collection

EUS guided biliary drainage

Accessible papilla?

Yes: EUS-RV → PTBD or Surgery

Either: EUS-CDS or EUS-HGS

No: EUS-AG

Failed: EUS-CDS or EUS-HGS

Failed: EUS-AG

Transpapillary:
 EUS-RV: EUS Rendezvous ERCP
 EUS-AG: EUS antegrade stenting
Transhepatic:
 EUS-CDS: EUS choledochoduodenostomy
 EUS-HGS: EUS hepaticogastrostomy

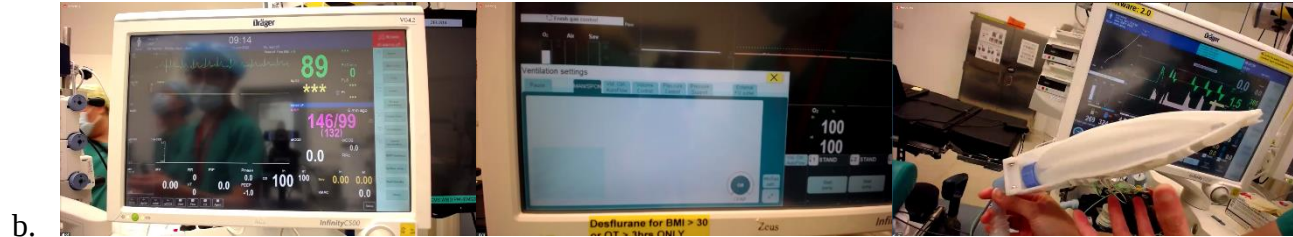
Iwashita et al. Clin J Gastroenterol 2014

Date: 11/06/2022

Session: Department of Anaesthesia and Intensive Care

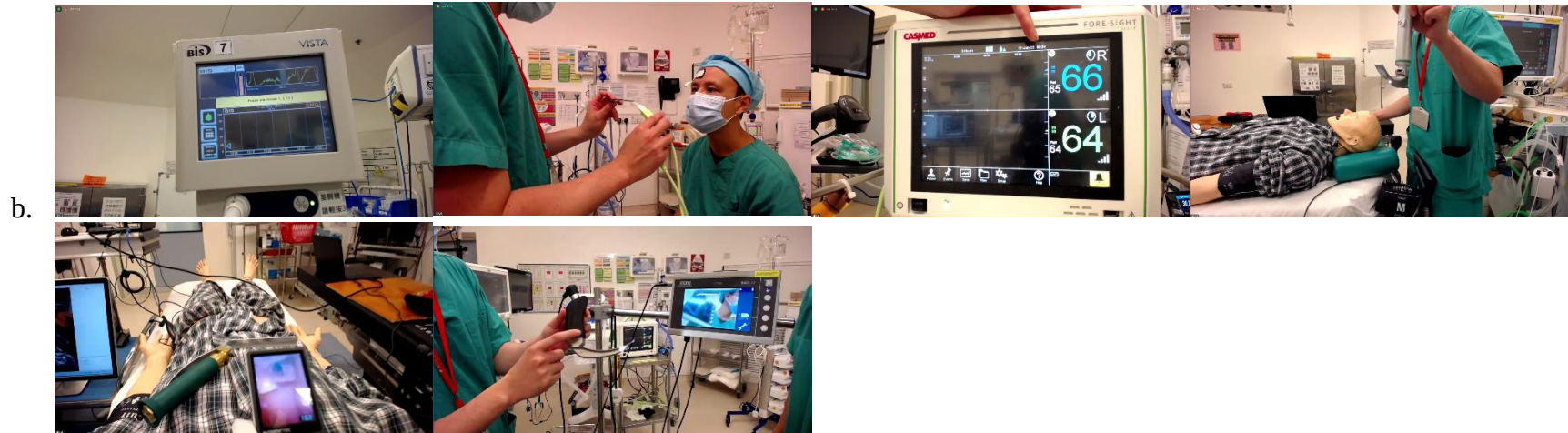
1. Anaesthetic machine

- a. Lecturer introduced the basic functionalities of anaesthetic machines



2. Monitors

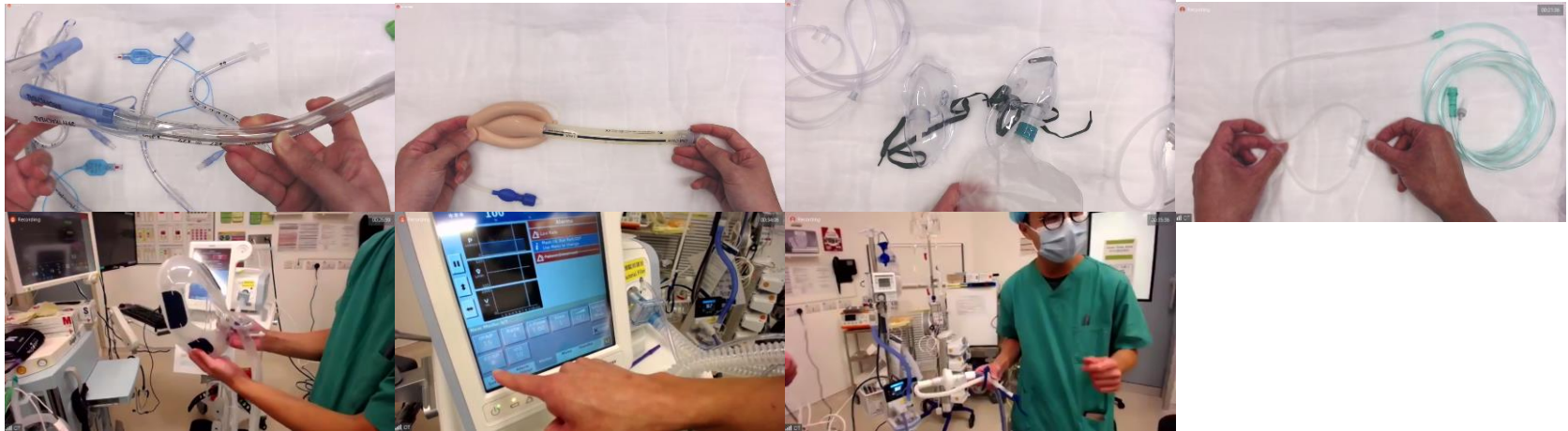
- a. Lecturer introduced some vitality monitors as well as some scopes that can show airway obstructions



3. Ventilators

- a. Lecturer introduced 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.

