

PRODUCTION OF RADIOISOTOPES FOR MEDICAL USE AND DEMAND IN MALAYSIA

Dr. Nor Salita Binti Ali

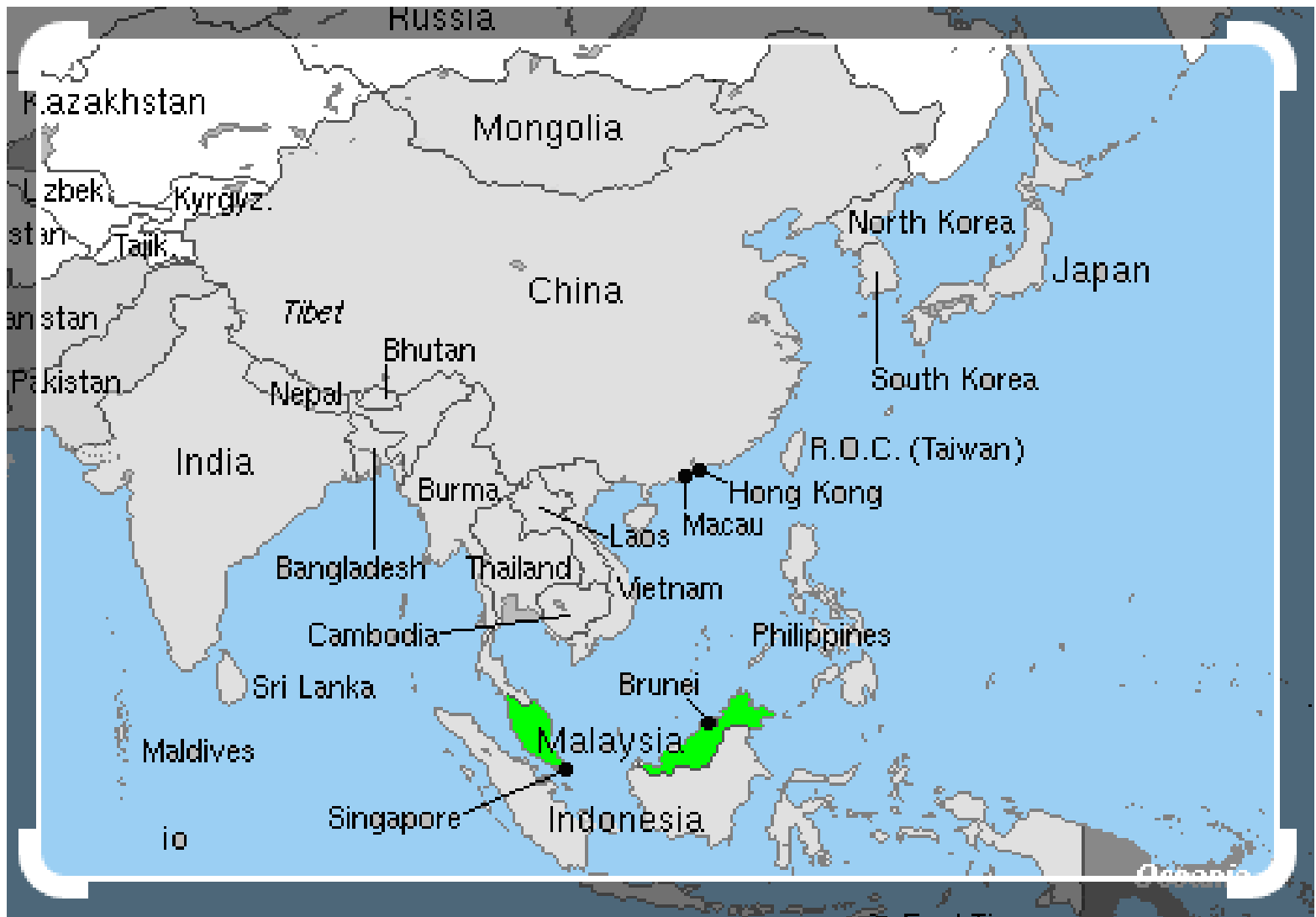
Head of Department and Nuclear Medicine
Physician,

Institut Kanser Negara

Outline of Presentation

- Malaysian Situation
- Current issues,
- Future challenges, and
- Best practices

LOCATION OF MALAYSIA



Malaysian Population by 2023 was 34,308,525

Department of Statistics Malaysia (DOSM) 2023 report:

- ❑ Ischaemic heart disease is the principal causes of death
- ❑ cancer is the fourth leading cause of death in Malaysia, increasing from 10.5 per cent in 2021 to 12.6 per cent in 2022.

Malaysia National Cancer Registry:

- ❑ 168,822 new cancer cases were reported from 2017 to 2021,
- ❑ Over 20 000 cases yearly.
- ❑ 60% are detected at advanced stages, namely stages three and four.

10 MOST COMMON CANCERS IN M'SIA

For men

- 
- Bowel/colorectal
 - Lung
 - Prostate
 - Lymphatic
 - Nasopharyngeal
 - Liver
 - Leukaemia
 - Stomach/gastric
 - Skin
 - Bladder

For women

- 
- Breast
 - Bowel/colorectal
 - Cervical
 - Lung
 - Ovarian
 - Uterine
 - Lymphatic
 - Thyroid
 - Leukaemia
 - Skin

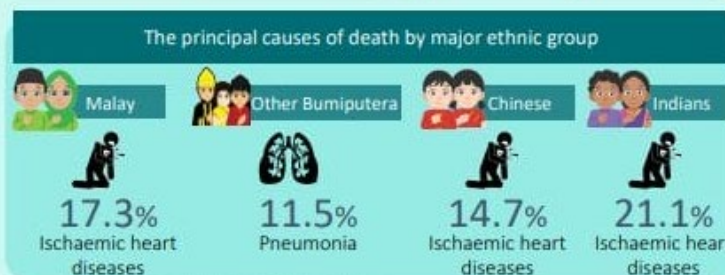
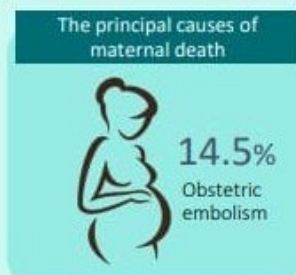
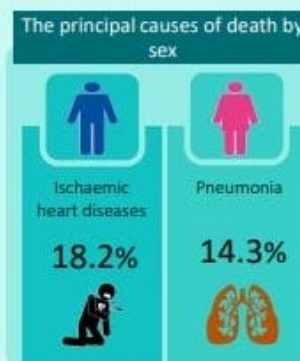
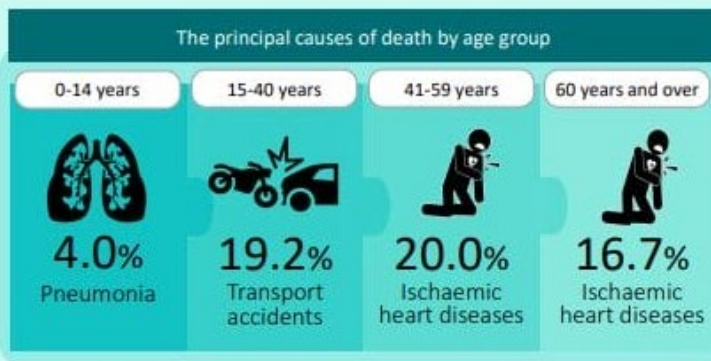
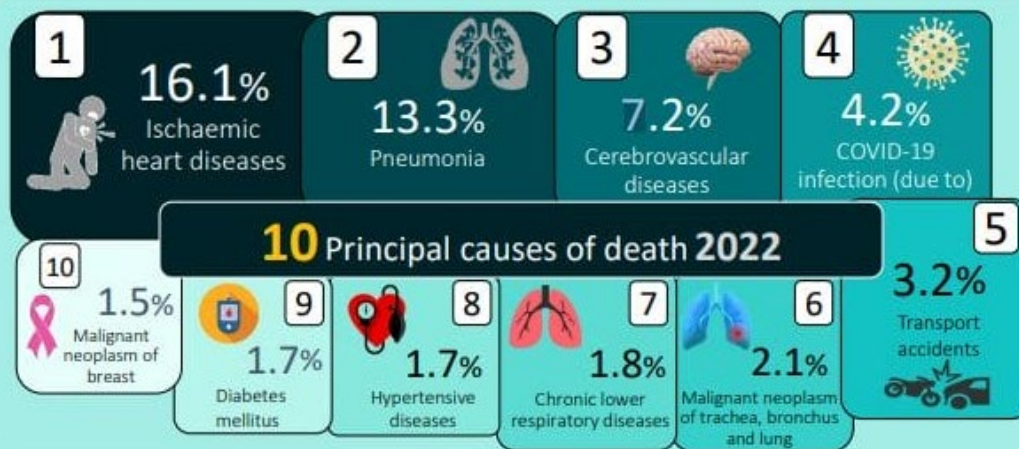
HPV: Human papillomavirus

Source: National Cancer Society of Malaysia (NCSM) managing director, Dr M. Murallitharan

Published: Dec 6, 2022
Bernama Infographics



STATISTICS ON CAUSES OF DEATH, MALAYSIA, 2023



Note: The analysis is based on medically certified causes of death which represent 61.1% of total deaths.

Nuclear Medicine Practices in Malaysia

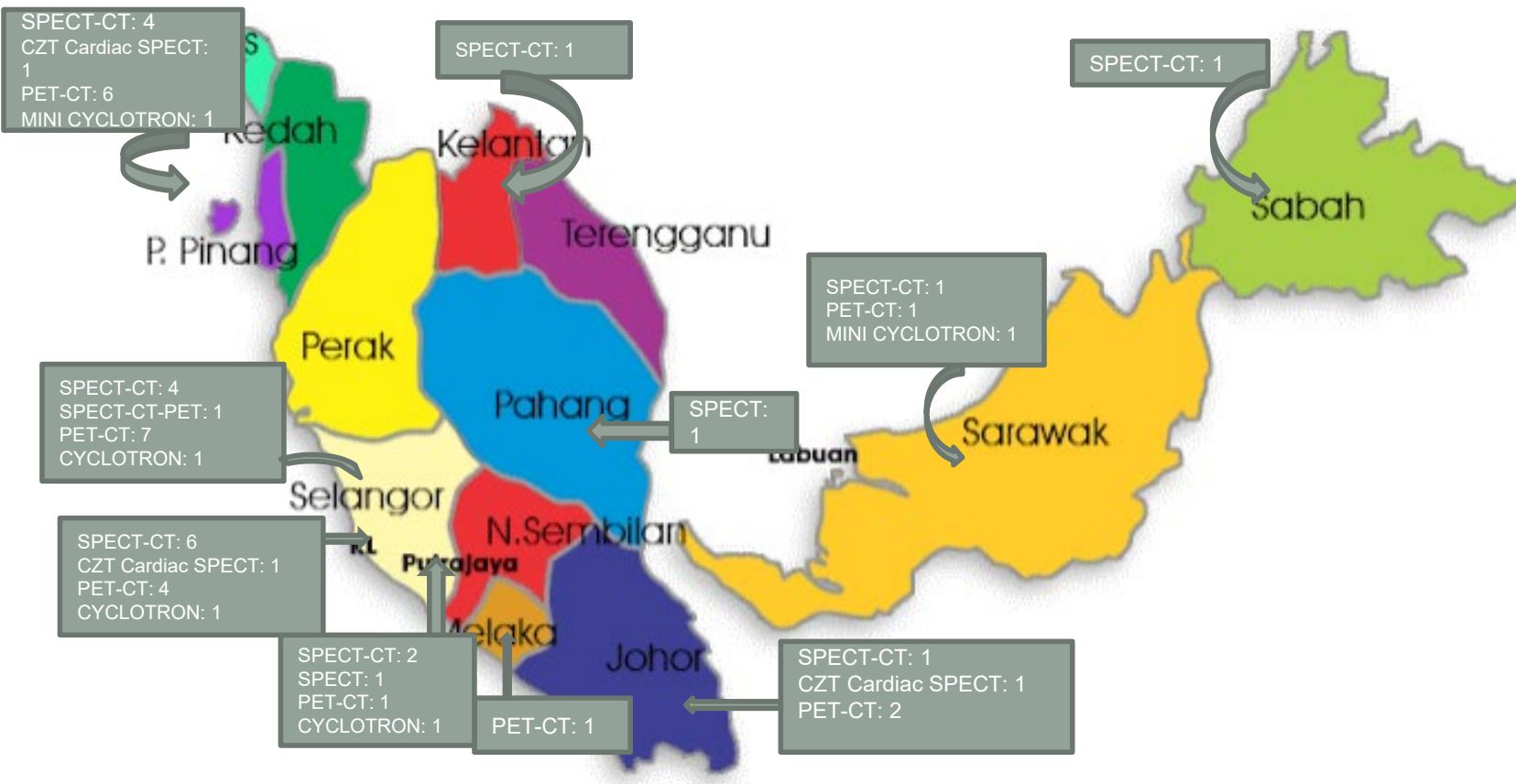
1. Public Hospitals /Ministry of Health (MOH)
2. Private Hospitals
3. Ministry of Education (MOE)



Top 10 Urban Areas in Malaysia



Distribution of SPECT, SPECT-CT, PET-CT and Cyclotron



SPECT=2, CZT Cardiac SPECT=3, SPECT-CT=20, PET-CT=22, SPECT-CT-PET=1 and Cyclotron=5

MOH: SPECT=1, CZT Cardiac SPECT=2, SPECT-CT=9, PET-CT=2+1

MOE: SPECT=1, SPECT-CT=5, PET-CT=3

Private: CZT Cardiac SPECT=1, SPECT-CT=6, PET-CT=17, SPECT-CT-PET=1

Diagnostic Imaging

General (SPECT)

- Technetium- 99m based radiopharmaceuticals
- Sentinel node mapping
- Stress and rest myocardial perfusion imaging
- Radioiodine diagnostic Whole Body Scan
- I-131 MIBG Scan

PET-CT

- F-18 FDG
- Ga-DOTA-peptide
- Ga-68 PSMA
- Ga-68 FAPI
- Iodine -124 for metastatic well differentiated thyroid cancer

Diagnostic Non Imaging

- Cr- 51 EDTA Glomerular filtration rate (GFR) measurement for renal clearance
- Tc- 99m GFR
- Serum calcitonin level using Iodine-125

Radionuclide Therapy: Malignant

- Radioiodine for well differentiated thyroid cancer
- Lu-177 DOTATATE for neuroendocrine tumor (NET), paraganglioma, pheochromocytoma
- Lu-177 PSMA for prostate cancer
- Iodine-131 MIBG for paraganglioma, pheochromocytoma
- SIRT using Y-90 sphere for liver cancer or liver metastasis
- Samarium-153 EDTMP for palliative painful bone metastases
- Actinium-225 PSMA for prostate cancer
- Actinium-225 DOTA-peptide for NET
- Radiotherapy Planning using PET-CT

Therapy: Benign

- Radioiodine for benign thyroid disease.
- Radio synovectomy using Y-90, Re-186 and Er-169 for Hemophilia and Arthritis.
- Y-90 citrate for ventricular-peritoneal shunt.

Radiation Oncology

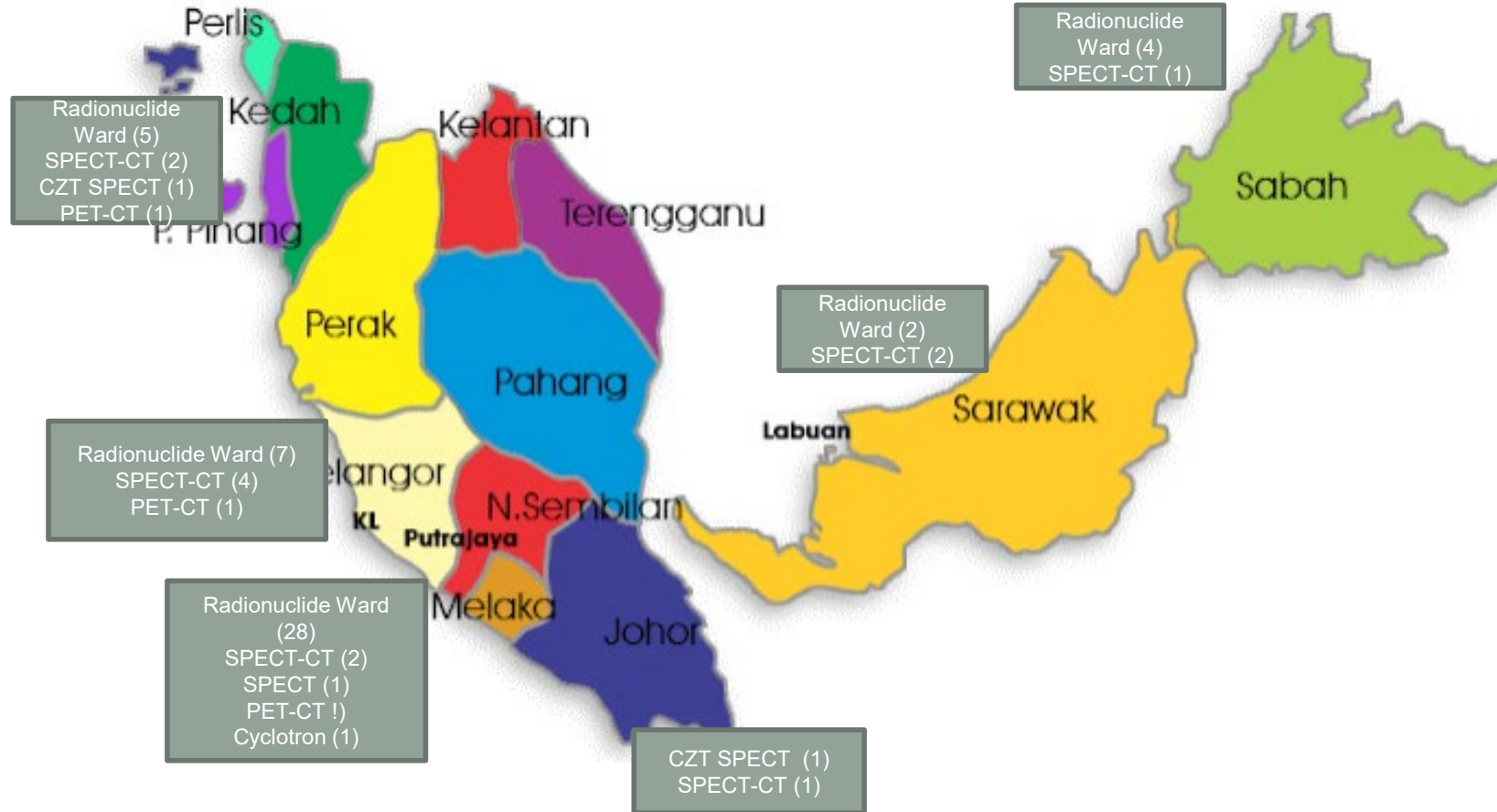
- Seed implant for cancer
 - Iridium -192
 - Cobalt - 60
 - Iodine - 125

Production and Supply of Radioisotopes

- 1 reactor for investigational purposes and produce Samarium.
- 5 cyclotrons, mainly to produce F-18 FDG.
 - 3 10 -16.4Mev
 - 2 mini cyclotron (7.5MeV)
- Generator
 - Mo/Tc Generator
 - Germanium-68/Ga-68 Generator
 - Sr-82/Rb-82 Generator
- Ready to use radioisotopes such as Iodine-131, Iodine-131 MIBG, Y-90 and Erbium are imported
- Lu-177 will be labelled with DOTA-peptide and PSMA as an in house procedure.

Current Issues

- All radiopharmaceuticals are imported from overseas except for F-18 FDG, Ga-68 (IKN only) and Samarium-153.
- Expensive/High Cost
- Uneven distribution of NM facilities
- Few Government Centers offering PET-CT services (3/23) but the number of patients attending public hospitals are more than private hospitals giving rise to long waiting time.



Nuclear Medicine Centre under Ministry of Health (MOH), Malaysia

Future Challenges

- Financial/Cost
- To start Theragnostic in all MOH centres
- To start on Alpha therapy with Astatine-221 (prostate cancer, refractory thyroid cancer, malignant glioma, pancreatic cancer, and malignant melanoma) in MOH
- To start therapy Terbium
- Production of other types of PET and SPECT radiopharmaceuticals
- To equip the existing NM center; and
- To increase the number of NM centre under MOH in other parts of Malaysia

Best Practices

- Locally produced radiopharmaceuticals
- More and equal distribution of the NM facilities throughout the country, mainly under MOH
- Centralised radiopharmaceutical services
- Production of other types of PET radiopharmaceuticals
- Health insurance



THANK YOU