

# **Project RAS6101**

**Improving the Quality and Safety of Radiation Medicine  
through Medical Physicist Education and Training (RCA)**

**46th NRM Meeting Project Performance Reports**

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*15 May 2024*

# Outline

- **Project description**
- **Recent activities**
- **Effectiveness and efficiency**
- **Gender equality**
- **Risk Management**
- **Project achievements**
- **Key findings and recommendations**

## **Project overview**

- **Priority: 1**
- **Lead country: China**
- **Project duration: 2022-2025**
- **Budget allocation: 617000 Euros**
- **Field of Activity: 29 - Dosimetry and medical physics**
- **Sustainable Development Goal**
  - **03 - Ensure healthy lives and promote well-being for all at all ages**

## Problem to be addressed

- Shortage of clinically qualified medical physicists (CQMPs) in the region
  - The ratio of the actual versus the required number of radiation oncology medical physicists was less than 0.5 for most of the countries, and 0.37, 0.37, 0.68, 0.34, 0.26, 0.35, and 0.43 for Bangladesh, China, India, Japan, Korea, the Philippines, and Thailand, respectively.

# Project objective and intended outcome

- **Overall Objective:** To improve the quality and safety of radiation medicine in the Asia–Pacific region through medical physicist education, training, and certification.
  - Harmonizing the existing and introducing new **postgraduate programmes**
  - Harmonizing the existing and introducing new **clinical training programmes**
  - Establishing **certification** schemes for CQMPs
  - Developing and enhancing **continuing professional development (CPD)** programmes in the region
- **Intended Outcome**
  - Increased number of CQMPs available and recognized in the region.

# Participating Member State(s)

Australia

Bangladesh

Cambodia

China

India

Indonesia

Japan

Korea, Republic of

Lao P.D.R.

Malaysia

Mongolia

Myanmar

Nepal

New Zealand

Pakistan

Palau

Philippines

Singapore

Sri Lanka

Thailand

Viet Nam

# Activities

- 2022
  - Launch meeting, Q2/2022;
  - RTCs on quality management and QA in radiotherapy medical physics, Q4/2022;
- 2023
  - RTC on Roles, Responsibilities, Education, Training and Certification of Clinically Qualified Medical Physicists, Q1/2023
  - RTC on quality management and QA in NM, DRL medical physics, Q2/2023;
- 2024
  - Midterm project management meeting), Q2/2024
  - RTC on regional harmonization of postgraduate academic programmes, Q3/2024
  - RTC Train the Trainers - clinical training, Q4/2024
- 2025
  - RTC on certification for medical physicists, Q1/2025
  - Close meeting, Q3/2025

## 1st RTC in 2022

- Quality management and QA in radiotherapy medical physics
- 12 Sep-14 Oct, 2022
- 51 registered participants (about 60 actually) attended
- Ruijie Yang, Peking University Third Hospital, China,
- Kum Bae Kim, Sang Hyoun Choi, Korea Institute of Radiological & Medical Sciences, Korea
- Andrew Alves, Australian Radiation Protection and Nuclear Safety Agency, Australia
- Hideyuki Mizuno, QST Hospital, Japan



# 1st RTC in 2022

| Date   | Lecture 1, 15:00-16:00   | Lecture 2, 16:30-17:30  |
|--------|--|---|
| Week 1 |  |   |
| 14.09  | Radiation protection of patients in radiotherapy [RY]  | Accidents in RT – lessons learned [KBK]   |
| 15.09  | Misadministrations in radiotherapy – risk management, incident reporting including SAFRON [RY] | Concept of quality management [KBK]   |
| Week 2 |  |   |
| 21.09  | Quality control procedures in radiotherapy: overview [RY]                                      | IGRT, IGRT QA and imaging dose management [KBK]   |
| 22.09  | Patient specific QA (3D CRT, IMRT) [KBK]   | Patient specific QA (SRS) [KBK]   |
| Week 3 |  |   |
| 28.09  | Dosimetry Audits: Basic principles [SHC]   | IAEA audits including QUATRO and end-to-end audits [RY]                                 |
| 29.09  | Dosimetry Audits: Dose measurement and dose delivery assessments [SHC]                         | Clinical dosimetry audits including small fields [RY]                                   |
| Week 4 |  |   |
| 05.10  | Brachytherapy audits [HM]  | ISO quality standards as applied to dosimetry audits [SHC]                              |
| 06.10  | Uncertainties of the measurements according to TRS 398 and TRS 483 [AA]                        | Uncertainty estimation of doses and dose comparisons during DAs [AA]                    |
| Week 5 |  |   |
| 12.10  | Auditing treatment planning including 3D-CRT audit [SHC]                                       | Auditing SRS [AA]   |
| 13.10  | Auditing advanced techniques including IMRT audit [AA]   | Experience and lessons learned from the national dosimetry audits in radiotherapy [SHC] |

# RTC on Roles, Responsibilities, Education, Training and Certification of Clinically Qualified Medical Physicists

*27-31 March 2023*

*Holiday Ao Nang Beach Resort Krabi, Thailand*

Government of Thailand, Philippines and Malaysia

- Anchali KRISANACHINDA – local organizer, Faculty of Medicine Chulalongkorn University, Bangkok, Thailand
- Mohd Ariff Bin Mohamed HANIFA, General Hospital Kuala Lumpur, Jalan Pahang, Kuala Lumpur, Malaysia
- Experts: Anchali Krisanachinda, Thailand, Anne Perkins, Australia, Paul Ravindran, India, Jonathan Corpuz, The Philippines

# Roles, Responsibilities, Education, Training and Certification of Clinically Qualified Medical Physicists

- ◆ Roles and Responsibilities of CQMPs
- ◆ Capacity building
- ◆ Academic education and principles of assessment
- ◆ Clinical training
- ◆ Certification
- ◆ Country presentations and common problems

# **Regional Training Course on Quality Management and Quality Assurance in Medical Imaging for Medical Physicists**

22-26/ May/ 2023

Hotel Grande Centre Point Ploenchit, Bangkok, Thailand

Government of Thailand

- **Anchali KRISANACHINDA – local organizer, Faculty of Medicine Chulalongkorn University, Bangkok, Thailand**
- **14 participants from Thailand and 18 participants from RCA GPs**
- **Experts: Anchali Krisanachinda, Napapong Pongnapang Thailand, Ioannis Delakis and Zoe Brady, Australia, Olivera Ciraj Bjelac, IAEA**

# Effectiveness

- The extent to which the project has achieved outputs and outcomes expected at this phase of the project: Very good
- The extent to which the project is on track: Very good
- How is the project achieving gender equality targets through activities and participation: Experts, participants
- Are there any significant changes in context: No

# Effectiveness

| Output   | Indicator and baseline                                     | Targets   | Status of achievement on each target |
|--|--|---|--------------------------------------|
| <b>Output 1: Project management Structure established</b>    | <b>Project management Structure</b>                        | <b>Project management Structure established</b>                   | <b>As planned</b>                    |
| <b>Output 2: Medical physicists trained on QM and audits</b> | <b>Physicists trained<br/>National training activities</b> | <b>100 physicists trained<br/>10 national training activities</b> | <b>As planned</b>                    |
| <b>Output 3: Clinical training programmes (AMPLE)</b>        | <b>Established programs</b>                                | <b>5 more countries participation</b>                             | <b>As planned</b>                    |
| <b>Output 4: Postgraduate programmes</b>                     | <b>Established and harmonized programs</b>                 | <b>10 more programs</b>   | <b>As planned</b>                    |
| <b>Output 5: certification and CPD</b>                       | <b>Established programs</b>                                | <b>Establishment according to international guidelines</b>        | <b>As planned</b>                    |

# Efficiency

- **The extent to which the project is making efficient use of time and resources towards the end of project outcomes.**
  - **Monitoring, evaluation and reporting: NPC annual reports, LCC annuals reports, activity reports**
  - **Budget management: more financial support is needed**
  - **Project staff numbers, skills and experience: very good**

# Risk Managements

- ◆ No special risks
- ◆ Artificial intelligence impact on the profession of medical physicist
  - ◆ Mid-term meeting topic



# Key findings and recommendations

## ■ Key findings

- Most of the participating countries had a common issue with the government support on medical physicist such as financial support and lack of supervisor to implementation of CTP
- Lack of structured postgraduate with clinical training programme
- Issue in certification and recognition of medical physicist

# Key findings and recommendations

## ■ Key recommendations

- DR and interventional radiology physicist
- National activities and national support
- Ten points recommendations
- Virtual/online activities
  - Virtual tumour boards, IAEA RAS6096
- Regional clinical training steering committee
- Cooperation with regional academical societies
  - Asia-Oceania Federation of Organizations for Medical Physics

# Ten points recommendations

**Recommendations to the government** (Ministry of Health, Ministry of Education, and the regulatory body/agency) with reference to Medical Physicists

- To recognize **Medical Physicist (MP) as a profession** as per the Basic Safety Standards (BSS GSR Part 3) World Health Organization's (WHO) and ILO recommendations.
- To recognize **the national professional society/ association** to manage, approve and certify the Clinically Qualified (CQ) MP program.
- To encourage **the MP clinical training** using IAEA curriculum and the AMPLE
- To offer **career progression, salary increment to MP's as an incentive to become CQMP.**
- To assist setting up a **steering committee to oversee CQMP program** (as per IAEA HHS 25).
- To approve **the issuance of certificates for successful CQMP candidates by professional societies/ association.**
- To create a **national register of CQMP.**
- To recommend all radiation medicine service providers **to adopt medical physics staffing levels** based on the IAEA recommendations (HHS 13 and 15) to ensure safe and effective diagnosis and treatment of patients.
- **To provide appropriate budgets** to support the development of medical physics continuous education, clinical training, and quality management audits.
- **To provide appropriate budgets** for QA/QC dosimetry, and safety equipment purchase.

# Acknowledgements-IAEA

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# Acknowledgements- Contacts and NPCs

| Country    | Contact                        | Institution  | Country     | Contact   | Institution  |
|------------|--------------------------------|--|-------------|---|--|
| Australia  | Robin Hill,                    | Chris O’Brien Lifehouse  | Malaysia    | MOHD ARIFF MOHAMED HANIFA                           | DEPARTMENT OF RADIOTHERAPY & ONCOLOGY, KUALA LUMPUR GENERAL HOSPITAL |
|            | Brendan Healy                  | Icon Group,  | Myanmar     | Myo Win   | Yangon General Hospital  |
| Bangladesh | Selim Reza                     | Bangladesh Atomic Energy Commission  | Nepal       | Kanchan P Adhikari                                  | National Academy of Medical Sciences, Bir Hospital                   |
| Cambodia   | TOUCH Soheat                   | Khmer Soviet Friendship Hospital   | New Zealand | Andy Cousins  | Canterbury District Health Board Christchurch Hospital               |
| China      | Ruijie Yang                    | Peaking University Third Hospital  | Pakistan    | Muhammad Basim Kakakhel                             | Pakistan Institute of Engineering and Applied Sciences               |
| India      | JaiPrakash Agarwal             | Tata Memorial Centre   | Philippines | Dan Joseph S. Manlapaz                              | Lung Center of the Philippines                                       |
| Indonesia  | Henry Kodrat Wahyu Edi Wibowo  | dr. Cipto Mangunkusumo Hospital  | Palau       | Ngirachisau Mekoll                                  | Palau National Hospital  |
| Japan      | Shigekazu Fukuda               | Japan Society of Medical Physics   | Singapore   | James C L Lee                                       | National Cancer Centre Singapore (NCCS)                              |
| Korea      | Kum Bae Kim                    | Korea Cancer Center Hospital, Korea Institute of Radiological & Medical Sciences | Sri Lanka   | Ranasinghe Arachchige Nirodha Chaturanga Ranasinghe | Sri Lanka Atomic Energy Board  |
| Laos       | Viphaphone Inphavong           | MITTAPHAB Hospital Ministry of Health  | Thailand    | Kanjana Shotelersuk                                 | Chulalongkorn University   |
| Malaysia   | Mohd Ariff Mohamed Hanifa      | Kuala Lumpur Hospital  | Vietnam     | Tran Ngoc Toan                                      | Vietnam Atomic Energy Institute                                      |
| Mongolia   | Enkee Enkhtsetseg Vanchinbazar | National Cancer Center of Mongolia   |             |   |  |

# Acknowledgements-Lead country

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**Leaders, colleagues**

**Gong Wang**

**...**

**National Health Commission**

**National Institute of Metrology**

**China Center for Disease Control**

**Chinese Society of Medical Physics**

**Beihang University**

**National Cancer Institute**

**Peking Union Hospital**

# Medical physicist in the Asia Pacific region

| Region       | 2016        | 2020        | Increase (%) | Education program   |
|--------------|-------------|-------------|--------------|---|
| Australia    | 248         | 450         |              | structured clinical training program, certified and registered by ACPSEM                              |
| Bangladesh   | 29          | 70          | 141          | No National Programme   |
| Cambodia     |             |             |              | No National Programme   |
| China        | 2000        | 4500        | 125          | More than 20 masters and doctoral programs. No officially accredited residency program.               |
| India        | 1200        | 1300        | 8            | structured, streamlined Education, affiliated by recognized Universities.                             |
| Indonesia    | 54          | 74          | 37           | 5 master program and 1 residency training program   |
| Japan        | 813         | 1252        | 54           | Japanese Board of Medical Physicist Qualification   |
| Korea        | 132         | 209         |              | 9 masters and doctoral programs. 5 programs accredited<br>3 residency programs are accredited by KSMP |
| Malaysia     | 80          | 109         | 36           | No national programme   |
| Myanmar      | 6           | 2           | -67          | No national programme   |
| Mongolia     | 6           | 6           | 0            | No national programme   |
| Nepal        | 8           | 18          | 125          | No national programme   |
| Pakistan     | 80          | 120         | 50           | Pakistan Institute of Engineering and Applied Sciences (PIEAS)  |
| Philippines  | 39          | 190         | 387          | 1 post-graduate program   |
| Singapore    | 20          | 61          | 205          | Residency is offered using the IAEA AMPLE program and syllabus  |
| Thailand     | 87          | 137         | 57           | 6 graduate programs for M.Sc  |
| <b>Total</b> | <b>4802</b> | <b>8498</b> | <b>67</b>    |   |



# Medical physicist in the Asia Pacific region

Table I.3 Survey of radiotherapy equipment and medical physics workforce

|             | Population<br>(millions)<br>2013 | Cancer<br>incidence<br>(new cases<br>per year)<br>2012 | Cancer<br>incidence<br>per million<br>population | No. of<br>radiotherapy<br>medical<br>physicists | No. of<br>radiotherapy<br>centres | No. of<br>operational<br>linacs | No. of<br>operational<br>cobalt-60<br>machines | No. of<br>operation<br>HDR or LDR<br>brachytherapy<br>units | No. of<br>operational<br>Tomotherapy<br>Cyberknife<br>Gammaknife<br>units |
|-------------|----------------------------------|--|--|---|-----------------------------------|---------------------------------|--|---|---|
| Australia   | 23                               | 122031   | 5306   | 248   | 56                                | 139                             | 0  | 25  | 3   |
| Bangladesh  | 157                              | 122715   | 782  | 29  | 18                                | 15                              | 12   | 12  | 0   |
| Cambodia    | 15                               | 14544  | 970  | 1   | 1                                 | 1                               | 0  | 0   | 0   |
| China       | 1357                             | 3065438  | 2259   | 2000  | 1500                              | 1369                            | 243  | 500   | 250   |
| India       | 1252                             | 1014934  | 811  | 1200  | 390                               | 370                             | 230  | 250   | 15  |
| Indonesia   | 250                              | 299673   | 1199   | 54  | 29                                | 26                              | 22   | 12  | 1   |
| Japan       | 127                              | 703863   | 5542   | 813   | 705                               | 829                             | 12   | 37  | 136   |
| Malaysia    | 30                               | 37426  | 1248   | 80  | 26                                | 47                              | 2  | 6   | 0   |
| Mongolia    | 2.8                              | 4053   | 1448   | 6   | 1                                 | 0                               | 3  | 1   | 0   |
| Myanmar     | 53                               | 63633  | 1201   | 6   | 7                                 | 4                               | 5  | 2   | 1   |
| Nepal       | 28                               | 18802  | 672  | 8   | 5                                 | 3                               | 3  | 4   | 0   |
| New Zealand | 4.8                              | 21337  | 4445   | 54  | 8                                 | 25                              | 0  | 3   | 0   |
| Pakistan    | 182                              | 148041   | 813  | 80  | 30                                | 20                              | 25   | 15  | 3   |
| Philippines | 98                               | 98249  | 1003   | 39  | 23                                | 29                              | 4  | 16  | 3   |
| R of Korea  | 50                               | 219520   | 4390   | 132   | 89                                | 159                             | 0  | 32  | 49  |
| Singapore   | 5.4                              | 15693  | 2907   | 20  | 5                                 | 20                              | 0  | 4   | 2   |
| Sri Lanka   | 21                               | 23665  | 1127   | 22  | 7                                 | 3                               | 9  | 3   | 1   |
| Thailand    | 67                               | 123801   | 1848   | 87  | 28                                | 59                              | 15   | 27  | 3   |
| Vietnam     | 90                               | 125036   | 1389   | 115   | 30                                | 43                              | 4  | 7   | 7   |
| Total       | 3813                             | 6242454  |  | 4994  | 2958                              | 3161                            | 589  | 956   | 474   |



# Medical physicist in the Asia Pacific region

Table I.4 Analysis of radiotherapy needs and medical physics workforce needs

|             | Required no. of EBRT units | Ratio current/required EBRT units |  | No of RTMPs required (equipment) | No of RTMPs required (EBRT planning) | No of RTMPs required (brachytherapy) | Total No. of RTMPs required | Ratio current/required RTMPs |
|-------------|----------------------------|-----------------------------------|--|----------------------------------|--------------------------------------|--------------------------------------|-----------------------------|------------------------------|
| Australia   | 153                        | 0.91                              |  | 202                              | 102                                  | 40                                   | 345                         | 0.72                         |
| Bangladesh  | 153                        | 0.18                              |  | 40                               | 19                                   | 19                                   | 79                          | 0.37                         |
| Cambodia    | 18                         | 0.06                              |  | 2                                | 1                                    | 0                                    | 3                           | 0.38                         |
| China       | 3832                       | 0.42                              |  | 3252                             | 1341                                 | 800                                  | 5392                        | 0.37                         |
| India       | 1269                       | 0.47                              |  | 914                              | 443                                  | 400                                  | 1757                        | 0.68                         |
| Indonesia   | 375                        | 0.13                              |  | 65                               | 35                                   | 19                                   | 120                         | 0.45                         |
| Japan       | 880                        | 0.96                              |  | 1618                             | 703                                  | 59                                   | 2381                        | 0.34                         |
| Malaysia    | 47                         | 1.05                              |  | 73                               | 35                                   | 10                                   | 118                         | 0.68                         |
| Mongolia    | 5                          | 0.79                              |  | 2                                | 2                                    | 2                                    | 6                           | 0.99                         |
| Myanmar     | 80                         | 0.11                              |  | 14                               | 7                                    | 3                                    | 24                          | 0.25                         |
| Nepal       | 24                         | 0.26                              |  | 10                               | 4                                    | 6                                    | 21                          | 0.38                         |
| New Zealand | 27                         | 0.94                              |  | 33                               | 18                                   | 5                                    | 56                          | 0.96                         |
| Pakistan    | 185                        | 0.24                              |  | 65                               | 35                                   | 24                                   | 123                         | 0.65                         |
| Philippines | 123                        | 0.27                              |  | 60                               | 26                                   | 26                                   | 112                         | 0.35                         |
| R of Korea  | 274                        | 0.43                              |  | 301                              | 150                                  | 51                                   | 502                         | 0.26                         |
| Singapore   | 20                         | 1.02                              |  | 28                               | 16                                   | 6                                    | 50                          | 0.40                         |
| Sri Lanka   | 30                         | 0.41                              |  | 15                               | 9                                    | 5                                    | 29                          | 0.77                         |
| Thailand    | 155                        | 0.48                              |  | 103                              | 55                                   | 43                                   | 202                         | 0.43                         |
| Vietnam     | 156                        | 0.30                              |  | 81                               | 39                                   | 11                                   | 131                         | 0.88                         |

$$\text{Required RTMPs} = 1.0 \cdot A + 1.0 \cdot B + 0.34 \cdot C + 1.0 \cdot D + 0.4 \cdot E + 0.4 \cdot F + 0.1 \cdot G$$

A=LINAC; B=TOMOTHERAPY/CYBERKNIFE/GAMMAKNIFE; C=CO-60 TELETHERAPY; D=TPS (1 PER DEPARTMENT); E=HDR/LDR BRACHYTHERAPY; F= CT-SIM (1 PER DEPARTMENT); G=DEPARTMENT RADIATION SAFETY AND PROTECTION

(Radiation Protection No 174, European Guidelines on Medical Physics Expert)

# Medical physicist clinical training in the Asia Pacific region

Table I.2 Survey of medical physics clinical training programmes

| Country     | Length of clinical training (years) | Which body accredits clinical departments to undertake clinical training? | Guide used     | Is the structured programme administered by the professional body? | Do successful trainees receive certification? | Approx. how many trainees are enrolled in these programmes nation wide | Assessment techniques used |              |           |                |
|-------------|-------------------------------------|---|----------------|--|---|--|----------------------------|--------------|-----------|----------------|
|             |                                     |   |                |  |   |  | Competency assessment      | Written exam | Oral exam | Practical Exam |
| Australia   | 3                                   | ACPSEM  | ACPSEM         | Yes  | Yes, ACPSEM                                   | RTMP 100   | Yes                        | Yes          | Yes       | Yes            |
| Bangladesh  | 2                                   |   | IAEA           |  | Yes   | RTMP 8<br>NMMP 5   | Yes                        | Yes          | Yes       | Yes            |
| China       | 3                                   |   | Local hospital |  |   | RTMP 80<br>DRMP 20<br>NMMP 20  | Yes                        | Yes          | No        | Yes            |
| India       | 1                                   | AERB  | AERB/BARC      | No   | Yes   |  | Yes                        | Yes          | Yes       | Yes            |
| Indonesia   | 2                                   |   | IAEA           |  |   | RTMP 6<br>DRMP 1   | Yes                        | Yes          | Yes       | Yes            |
| Japan       | 1                                   | U of Tsukuba  | Other          |  |   |  | No                         | No           | Yes       | Yes            |
| Malaysia    | 3                                   |   | IAEA           |  | Yes   |  | Yes                        | Yes          | Yes       | Yes            |
| New Zealand | 3                                   | ACPSEM  | ACPSEM         | Yes  | Yes, ACPSEM                                   |  | Yes                        | Yes          | Yes       | Yes            |
| Pakistan*   | 2                                   |   | IAEA           |  |   |  | Yes                        | Yes          | Yes       | Yes            |
| Philippines | 2-3                                 | None  | IAEA           | Yes, jointly with Dept of Health                                   | Yes, POMP                                     | RTMP 34<br>DRMP 15<br>NMMP 3   | Yes                        | Yes          | Yes       | Yes            |
| R of Korea  | 3                                   | KBMP  | KBMP           | Yes  | Yes, KBMP                                     |  | Yes                        | Yes          | Yes       | No             |
| Thailand    | 2                                   | Educational Council, Ministry of University Affairs                       | IAEA           | Yes  | Yes   | RTMP 19<br>DRMP 7<br>NMMP 3  | Yes                        | Yes          | Yes       | Yes            |

\*ABBASI, A N; MUHAMMAD, W; HUSSAIN, A., Implementation of quality medical physics training in a low-middle income country — sharing experience from a tertiary care JCIA-accredited university hospital. J Appl Clin Med Phy 17 (2016).

The following countries indicated that there are no structured medical physics clinical training programmes in their country: Cambodia, Mongolia, Myanmar, Nepal, Sri Lanka, Singapore, and Vietnam.