The Asian Pharmacometrics Network: The historical background, establishment, objectives and roles, and recent activities

The Asian Pharmacometrics Network (APN) has been established to enhance regional development in pharmacometrics by holding annual regional symposiums and to provide training opportunities across Asia by hosting educational workshops. Starting with nine member countries in 2017, APN has been expanded to include up to 16 countries as of December 2021. We are presenting this article to describe the historical background, establishment, objectives, roles, and recent activities of APN.

ORIGIN OF APN

World Conference on Pharmacometrics

The establishment of the Asian Network in Pharmacometrics dates back to 2012 when the first World Conference on Pharmacometrics (WCoP) was held in Seoul, Korea, on September 5–7, 2012.1

The WCoP in 2012 (WCoP2012), comprising the satellite workshops and the main symposium, was a big success with 333 participants; among them, the number of foreign participants was 218 (65%), including 98 (29%) from outside Asia, which is the largest number and percentage of foreign participants in any pharmaceutical meeting held in Korea to date. The satellite workshops provided opportunities for hands-on training in the use of pharmacokinetic–pharmacodynamic modeling software such as NONMEM, Phoenix WinNonlin, Phoenix NLME, and Monolix, and learning newly emerging modeling approaches such as physiologically based pharmacokinetic (PBPK) and target-mediated drug disposition models.

As a result of such success, it turned out that WCoP2012 contributed to fueling the interest in pharmacometrics among Asian countries.

Regional Advisory Committee of WCoP2012

During the WCoP2012 period, the members of the regional Advisory Committee (AC) of WCoP2012 (Atsunori Kaibara for Japan, Feng Guo for China, Chun-Jung Lin for Taiwan, Lai-San Tham for Singapore, Surulivel Rajan for India, and Kyungsoo Park for Korea) initiated a discussion on how to develop and promote pharmacometrics in the Asian region. This marked the beginning of the creation of the Asian Network in Pharmacometrics.

PHARMACOMETRICS STATUS IN ASIA BEFORE WCoP2012

The extent of pharmacometrics development of a region can be judged by the existence of pharmacometrics groups and the experience in hosting international pharmacometrics meetings and workshops. For pharmacometrics groups, four formal groups existed in Asia before WCoP2012, namely, the Professional Committee of Pharmacometrics of China (PCPC) founded in 1979, the Population Approach Group in Japan (PAGJA) founded in 1985, the Population Approach Group in Korea (PAGK) founded in 2006, and the Population Approach Group India (PAGIN) founded in 2008.

International pharmacometrics meetings and workshops held before WCoP2012 are summarized in Table 1. It is apparent that continually growing interest in pharmacometrics existed in the East Asian region before WCoP2012.

JOINT INTERNATIONAL SYMPOSIUMS EMERGING AFTER WCoP2012

Building on the success of WCoP2012, efforts were made to establish international symposiums jointly organized
The first outcome of such efforts was the first PAGJA-PAGK Joint Symposium, which was held on November 28, 2013, in Seoul, Korea, followed by the second PAGJA-PAGK Joint Symposium held on November 7, 2014, in Kobe, Japan. With PCPC joining, the PAGJA-PAGK Joint Symposium then developed into Asian Pharmacometrics Conference (APC) in 2017.

**ESTABLISHMENT OF APN**

Influenced by such joint activities to network between local organizations of the three countries, in December 2014, Kyungsoo Park was elected as the first International Society of Pharmacometrics (ISoP) board member representing the Asian region, and ISoP’s inviting him to be a board member was part of its mission to extend its role in promoting pharmacometrics to the Asian region.

Motivated by this, in 2015 the AC members resumed the discussion they initiated during WCOP2012 on developing and promoting pharmacometrics in the Asian region. In doing so, two Southeast Asian countries, namely, Thailand and Malaysia, joined the AC, resulting in the number of AC members increasing from six to eight, and the AC was renamed the APN. Later in January 2017, as Vietnam joined the APN, the number of APN member countries increased from eight to nine, and the representatives of each country formed the inaugural APN board. Then, after the first APN symposium in 2019, five new representatives from Indonesia, Myanmar, Nepal, Sri Lanka, and Cambodia joined the APN board, and in 2021, Pakistan joined APN in January and Brunei in November, expanding the number of APN member countries up to 16 (Table 2).

The establishment of APN was endorsed by the APN steering committee, which consists of representatives of local pharmacometrics groups of PAGJA, PAGK, PCPC, and PAGIN.

APN and APC are independent from each other and run differently. How they differ is described in detail in the Supplementary Information.

### TABLE 1

| (a) Pharmacometrics meetings                                                                 |
|---------------------------------------------------------------------------------------------|
| **Title**                                                                                   |
| Lewis Sheiner Memorial Symposium in Modeling & Simulation<sup>a</sup><sup>,a</sup>            |
| The International Symposium on Quantitative Pharmacology (IQSP)<sup>b</sup>                  |
| **Place**                                                                                  |
| Seoul, Korea                                                                               |
| Nanjing, China                                                                             |
| **Month/year**                                                                             |
| November 2006                                                                              |
| October 2007                                                                               |

<sup>a</sup>Lewis Sheiner Memorial Symposium: with 24 speakers invited, consisting of 19 international (12 outside Asia) and five domestic experts, it was a forerunner that set the momentum for Asian countries in hosting international pharmacometrics meetings.

<sup>b</sup>The second and third ISQPs were held in 2010 and 2011, respectively.

| (b) Pharmacometrics workshops (selected)                                                    |
|---------------------------------------------------------------------------------------------|
| **Title**                                                                                  |
| PAGANZ with hands-on NONMEM Workshop (PAWS)                                                |
| Intermediate NONMEM Workshop                                                               |
| Sheiner/Rowland Advanced PK/PD Course<sup>2</sup>                                          |
| Uppsala NONMEM Workshop<sup>10</sup>                                                       |
| NONMEM Workshop                                                                           |
| Hands-On Workshop on Basic Pharmacokinetics and Pharmacodynamics Modeling                   |
| Workshop on Population Pharmacokinetics and Pharmacodynamics                               |
| **Instructors**                                                                            |
| Nick Holford, Carl Kirkpatrick, Bruce Green                                                |
| Dennis Fisher, Steve Shafer                                                                  |
| Leon Aarons, Nick Holford, Mats Karlsson, France Mentre, Steve Duffull                     |
| Mats Karlsson, Andrew Hooker, Radokja Savic                                                |
| Nick Holford                                                                               |
| Nick Holford                                                                               |
| Nick Holford                                                                               |
| Marc Gastronguay et al.                                                                     |
| **Place**                                                                                  |
| Singapore                                                                                  |
| Seoul, Korea                                                                               |
| Seoul, Korea                                                                               |
| Seoul, Korea                                                                               |
| Seoul, Korea                                                                               |
| Beijing, China                                                                             |
| Kuala Lumpur, Malaysia                                                                     |
| Taiwan                                                                                     |
| **Month/year**                                                                             |
| February 2007                                                                              |
| February 2008                                                                              |
| September 2009                                                                             |
| September 2010                                                                             |
| October 2010                                                                               |
| February 2012                                                                              |
| 2012                                                                                       |

WCOP2012, World Conference on Pharmacometrics in 2012; PAGANZ, The Population Approach Group of Australia and New Zealand.

<sup>a</sup>Lewis Sheiner Memorial Symposium: with 24 speakers invited, consisting of 19 international (12 outside Asia) and five domestic experts, it was a forerunner that set the momentum for Asian countries in hosting international pharmacometrics meetings.

<sup>b</sup>The second and third ISQPs were held in 2010 and 2011, respectively.
OBJECTIVES AND ROLES OF APN

The APN has started with the following objectives and roles:

Objectives

(i) Enhance and expand regional development and networking opportunities in pharmacometrics by holding annual symposiums outside Japan, China, and Korea and thereby giving a local stimulus.

(ii) Provide training opportunities to future pharmacometricians by holding regular and affordable educational workshops.

Compared with WCoP’s objectives,¹ one can see that, in addition to the similar objective of enhancing development and networking opportunities in pharmacometrics, APN has an additional objective of training future pharmacometricians by holding educational workshops in the region.

The symposium venue will rotate among member countries; however, considering a series of international symposiums and workshops already held in China, Japan, and Korea, these three countries will not be preferred locations in the beginning years. This is to facilitate the development of pharmacometrics outside the three countries, thereby giving a local stimulus. Thus, APN will be working toward having an annual symposium.

TABLE 2 APN board members

| Name                         | Affiliation              | Country       |
|------------------------------|--------------------------|---------------|
| Kyungsoo Park⁵ (Chair)       | Yonsei University        | Korea         |
| Atsunori Kaibara⁵            | Eli Lilly                | Japan         |
| Rujia Xie⁵ᵇᶜ                  | Pfizer                   | China         |
| Keyue Ma⁵ᵈ                   | Pfizer                   | China         |
| Ao Peng⁵ᵉ                     | Pfizer                   | China         |
| Chun-Jung Lin⁵ᵇ               | National Taiwan University | Taiwan       |
| Yunn-Fang Ho⁵ᶠ                | National Taiwan University | Taiwan       |
| Lai-San Tham⁵ᵇ                | Eli Lilly                | Singapore     |
| Surulivelrajan Mallayasamy⁵ᵇᵉ | Manipal College of Pharmaceutical Sciences (MCOPS), Manipal Academy of Higher Education | India         |
| Korbtham Sathirakul          | Mahidol University       | Thailand      |
| Yoke-Lin Lo                   | International Medical University | Malaysia   |
| Van Toi Pham                  | Oxford University Clinical Research Unit | Vietnam |
| Manh Hung Tran⁵ᵇ              | University of Medicine and Pharmacy | Vietnam |
| Akhmad Kharis Nugroho         | Universitas Gadjah Mada  | Indonesia     |
| Khin Myo Oo                   | University of Mandalay   | Myanmar       |
| Bimal Kunwar                  | Nobel College of Health Science | Nepal       |
| Uthpali Mannapperuma          | University of Colombo    | Sri Lanka     |
| Kimheang Ya                   | University of Puthisastra | Cambodia     |
| Muhammad Usman                | University of Veterinary and Animal Sciences | Pakistan     |
| Long Chiau Ming               | Universiti Brunei Darussalam | Brunei    |

Abbreviations: APN, Asian Pharmacometrics Network; WCoP2012, World Conference on Pharmacometrics in 2012; AC, regional Advisory Committee of WCoP2012.

¹Board members’ affiliation history with local pharmacometrics groups: Kyungsoo Park: president of Population Approach Group in Korea (2011–2014) and board member of Korean Society of Clinical Pharmacology and Therapeutics (2009–); Atsunori Kaibara: vice president of Population Approach Group in Japan (2003–2018) and leader of Model-Informed Drug Development (MIDD) Task Force in Japan–Pharmaceutical Research and Manufacturers of America (PhRMA) (2020–); Rujia Xie: committee member of Professional Committee of Pharmacometrics of China (2013–2017); Surulivelrajan Mallayasamy: secretary of Population Approach Group India (2010–2020); Yoke-Lin Lo: chairperson of the Population Approach Group of Malaysia (2019–2021 February) and committee member (February 2021–).

ªAC members of WCoP2012.

ᵇRujia Xie replaced Feng Guo, a founding AC member of China.

ᶜKeyue Ma replaced Rujia Xie as of November 2020.

ᵈAo Peng replaced Keyue Ma as of August 2021.

ᵉYunn-Fang Ho replaced Chun-Jung Lin as of August 2019.

ᶠSurulivelrajan Mallayasamy replaced Ram Sankaran, a founding AC member of India.

ᵍManh Hung Tran replaced Van Toi Pham as of August 2019.
continental meeting that is an educational opportunity open to all globally similar to Population Approach Group in Europe (PAGE), the flagship regional meeting on the globe.

**Roles**

Through annual symposiums and workshops, the APN is expected to become the main channel to promote networking and training opportunities for pharmacometrics communities in the Asian region, similar to PAGE. In addition, by accumulating real-world data within the network, APN will build up a regional Big Health Data network, thereby creating real-world evidence useful for drug development and treatment in the region. Last but not least, APN will develop a program to collaborate with the two other regional pharmacometrics networks, the Ibero-America Pharmacometrics Network and the Pharmacometrics Africa, thereby bridging collaborations between Asia and the rest of the world.

**RECENT ACTIVITIES OF APN**

**The 2019 APN symposium**

The first APN symposium, hosted by the Faculty of Pharmacy, Mahidol University, under the direction of Dr. Korbtham Sathirakul, was held on November 19–20, 2019, in Bangkok, Thailand, along with satellite workshops on November 18.5

In this inaugural 2019 APN symposium, approximately 200 people participated, which implies that in terms of launching APN, the inaugural APN symposium was an overwhelming success.

Also, speaker allocation was well balanced across countries, with 18 speakers invited from nine APN countries (six from Thailand; two each from India, Japan, Korea, and Taiwan; and one each from Malaysia, Nepal, Singapore, and Sri Lanka).

This balanced speaker allocation is attributed to APN’s efforts to enhance and expand regional development and networking opportunities by holding the symposium outside Japan, China, and Korea. Therefore, APN 2019 achieved its goal of providing a pan Asian networking opportunity, which cannot be seen in other international meetings in Asia, including APC.

Two satellite workshops were held, one focusing on PBPK instructed by Dr. Korbtham Sathirakul of Mahidol University, Thailand, and the other on quantitative systems pharmacology instructed by Dr. Dongwoo Chae of Yonsei University, Korea.

**The 2020 APN symposium**

The second APN symposium, hosted by the Society of Pharmacometrics and Health Analytics of India under the direction of Dr. Surulivelrajan Mallayasamy of the Manipal Academy of Higher Education, was held on November 18–19, 2019, as a virtual meeting because of COVID-19 restrictions, with registration fees waived to encourage participation.5

The 2020 APN symposium was also a success, with 365 people registered. Among the 18 invited speakers, 16 were from eight APN countries (India, Japan, Korea, Singapore, Thailand, Indonesia, Nepal, and Sri Lanka), also showing a balanced distribution of speaker participation among APN countries.

In this symposium, eight student speakers were also invited from APN member countries to provide presentation opportunities for future pharmacometricians for education and training purposes.

The satellite workshop, instructed by Dr. Vijay Ivaturi of the University of Maryland School of Pharmacy, United States, was held on November 20 with the topic “A New Age Modeling and Simulation Platform Pumas.”

**The 2021 APN workshop**

The 2021 APN educational workshop titled “Basic Pharmacometrics Course Using Monolix,” hosted by the Faculty of Pharmacy Universitas Gadjah Mada, Indonesia, under the direction of Dr. Akhmad Kharis Nugroho, was held virtually on June 3, 2021.6 The course was intended to focus on familiarizing students and scientists who are new to or wish to advance their knowledge in the area of pharmacometrics. In the workshop, the maximum capacity of 200 participants registered.

**The 2021 APN symposium**

The third APN symposium, hosted by the College of Medicine, National Taiwan University under the direction of Dr. Yunn-Fang Ho, was also held virtually because of COVID-19 restrictions on November 25–26, 2021, along with satellite workshops on November 21–24.7

Similar to the 2019 and 2020 symposiums, the 2021 APN symposium was also a success, with 268 people registered and speakers invited equally from 10 APN countries (two from Taiwan and one each from Japan, China, Korea, Singapore, India, Malaysia, Indonesia, Vietnam, and Pakistan), and seven student speakers were invited from APN countries.
For satellite workshops, Dr. Vijay Ivaturi gave a Pumas workshop on November 21–24 with the same topic as his 2020 APN satellite workshop but with advanced material, and Dr. Holford gave a satellite workshop on November 24 with the topic “Disease Progress and Drug Action,” which was organized for those to be trained as future workshop instructors.

**INFLUENCE OF RECENT ACTIVITIES OF APN**

The high attendance at APN symposiums so far has been positively correlated with academic achievements in the region. Although this might have been attributed to other drivers, as an example, we noted that the number of pharmacometrics-related publications in APN countries, except for China, Japan, and Korea, doubled from 21 to 41 during the period from 2019 to 2021 when searched in PubMed.

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**CONFLICT OF INTEREST**

The authors declared no competing interests for this work.

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REFERENCES

1. The First World Conference on Pharmacometrics, Seoul, Korea, September 5-7, 2012. http://www.wcop2012.org/. Accessed July 8, 2021.
2. The First PAGJA-PAGK Joint symposium, Seoul, Korea, November 28, 2013. http://www.kosphar.org/rang_board/list.html?num=1693&start=60&code=notice. Accessed July 8, 2021.
3. The first APN symposium. http://www.go-apn.org/. Accessed August 8, 2021.
4. The 2019 APN symposium. https://pharmacy.mahidol.ac.th/conference/info/index.php?conid=144. Accessed August 8, 2021.
5. The 2020 APN symposium. https://www.sophas.net/apn2020.html. Accessed March 3, 2021.
6. The 2021 APN workshop. https://farmasetika.farmasi.ugm.ac.id/apn-workshop2021/. Accessed August 8, 2021.
7. The 2021 APN symposium. https://apn-taiwan2021.conf.tw/. Accessed November 16, 2021.
8. The Lewis Sheiner Memorial Symposium in Modeling & Simulation, Seoul, Korea, November 15-16, 2006. http://www.pkpd-yonsei.or.kr. Accessed July 8, 2021.
9. Sheiner/Rowland Advanced PK/PD Course, Seoul, Korea, September 7-11, 2009. http://www.srpkipd.or.kr. Accessed July 8, 2021.
10. Uppsala NONMEM Workshop I, Seoul, Korea, September 27-29, 2010. http://www.uppsala-nmws.or.kr. Accessed July 8, 2021.

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