



Unity in Diversity and the Standardisation of Clinical Pharmacy Services

Editors: Elida Zairina, Junaidi Khotib,
Chrismawan Ardianto, Syed Azhar Syed Sulaiman,
Charles D. Sands III and Timothy E. Welty

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UNITY IN DIVERSITY AND THE STANDARDISATION OF CLINICAL
PHARMACY SERVICES



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Unity in Diversity and the Standardisation of Clinical Pharmacy Services

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Preface

The original idea of ACCP came from Asian pharmacists who were looking for a practical conference at which they could exchange and share ideas on the concept of clinical pharmacy. In 1996, representatives from China, Korea, Japan, and USA met in Seoul, Korea to plan for the first conference. As a result, the first East Asia Conference on Developing Clinical Pharmacy Practice and Clinical Pharmacy Education (EACDCPPE) was held in America in 1997. Only 36 representatives attended and pioneers planned it as bi-annual meeting.

In 1999, the second EACDCPPE was successively held in Shanghai. This conference enabled more representatives in Asian countries to realize the differences between Asian and Western countries in the development of clinical pharmacy. When the third conference was held in Japan in 2003, the title of the conference was changed to Asian Conference on Clinical Pharmacy (ACCP). This opened the conference to more Asian countries; also the subject of clinical pharmacy was more strengthened. With a series of other Asian countries such as Philippines, Indonesia, Singapore, and so on attending ACCP, as well as with the rapid development of clinical pharmacy in Asia, every country was enthusiastic about attending and holding this conference. At the 5th conference in Malaysia in 2005, the decision was made among the representatives of the member countries to hold the conference annually instead of biannually for efficiency and convenience in regard to communicating and sharing about clinical pharmacy.

During the past 20 years, ACCP has been a major event in the clinical pharmacy scope in Asia and has been conducted in various countries especially in Asia. Clinical pharmacists have attended this prestigious meeting to share their experience in the fields of practice, research, and education on clinical pharmacy. Clinical pharmacist experts from USA, Canada, Australia, and UK have continuously come to transfer their knowledge and shared advance clinical pharmacy practice experiences. This conference supports rapid knowledge and experience transfer and enhances the emergence of clinical pharmacy practice in Asia.

Indonesia hosted the 8th ACCP in Surabaya in 2008, and again this year Indonesia has successfully hosted the 17th ACCP in Yogyakarta from 28th to 30th July 2017. This year's conference was also a celebration of 20 years of ACCP with the theme "Unity in Diversity and the Standardisation of Clinical Pharmacy Services." At ACCP 2017, there were 6 preconference workshops, poster sessions consisted of 199 posters, 21 oral presentation sessions consisted of a total of 142 oral presentations, and there were symposiums with 47 speakers, 2 plenary sessions with 4 speakers and 4 keynote speeches regarding various current issues in clinical pharmacy. About 1,133 participants attended the conference from 16 different countries.

This ACCP 2017 proceeding provides an opportunity for readers to engage with selected papers presented at the 17th ACCP 2017. This book is also a valuable contribution to gaining a better understanding about the development of clinical pharmacy particularly in Asian countries and the future global challenges. Readers will find a broad range of research reports on topics of clinical pharmacy, social and administrative pharmacy, pharmacy education, pharmacoeconomics, pharmacoepidemiology and other topics in pharmacy. The readers will also discover both common challenges and creative solutions emerging from diverse settings in developing clinical pharmacy services.

The editors would like to thank all those who have contributed to submit full papers for this 17th ACCP conference. We received 119 papers from the conference and after a rigorous peer-review, 68 papers were accepted for publication in this proceeding of which 56 are from Indonesia and 12 from Australia, Malaysia, the Philippines, and Thailand. We would like to express our special appreciation and sincere thanks to the scientific committee and the reviewers who have selected and reviewed the papers, and also the technical editor's team (Ms Arie Sulistyarini and Ms Muffarihah) who helped carry out the page layout and check the consistency of the papers with the publisher's template. It is a great honour to publish selected papers in this proceeding by CRC Press/Balkema (Taylor & Francis Group). Our special gratitude goes to the steering committee, the chairman of the conference and the members of the organizing committee involved in preparing and organizing the conference. Finally, we would like to thank Universitas

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Endang Sulistyowati Ningsih, *Faculty of Mathematics and Natural Sciences, Universitas Islam Indonesia, Indonesia*
Lolita, *Faculty of Pharmacy, Universitas Ahmad Dahlan, Indonesia*
Franciscus Cahyo Kristianto, *Indonesian Pharmacists Association, Indonesia*

FUNDRAISING

Noffendri Roestam, *Indonesian Pharmacists Association, Indonesia*
Abdul Rahem, *Faculty of Pharmacy, Universitas Airlangga, Indonesia*
Ali Syamlan, *Dr Soetomo General Hospital, Indonesia*
Marlita Putri Ekasari, *Faculty of Pharmacy, Universitas Gadjah Mada, Indonesia*
Nanang Munif Yasin, *Faculty of Pharmacy, Universitas Gadjah Mada, Indonesia*
Lalu Muhammad Irham, *Faculty of Pharmacy, Universitas Ahmad Dahlan, Indonesia*

FOOD AND BEVERAGE

Dewi Wara Shinta, *Faculty of Pharmacy, Universitas Airlangga, Indonesia*

Yosi Febrianti, *Faculty of Mathematics and Natural Sciences, Universitas Islam Indonesia, Indonesia*

Pinasti Utami, *Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Indonesia*

FACILITIES AND EQUIPMENT

Catur Dian Setiawan, *Faculty of Pharmacy, Universitas Airlangga, Indonesia*

Christianus Heru Setiawan, *Faculty of Pharmacy, Universitas Sanata Dharma, Indonesia*

Yulianto, *Faculty of Mathematics and Natural Sciences, Universitas Islam Indonesia, Indonesia*

ACCOMMODATION AND TRANSPORTATION

Mutiara Herawati, *Faculty of Mathematics and Natural Sciences, Universitas Islam Indonesia, Indonesia*

Dita Maria Virginia, *Faculty of Pharmacy, Universitas Sanata Dharma, Indonesia*

Mawardi Ihsan, *Faculty of Pharmacy, Universitas Gadjah Mada, Indonesia*

Keynote speakers



Prof. Nila Djuwita F. Moeloek—*Minister of Health, Republic of Indonesia*

Prof. Nila Djuwita F. Moeloek is a professor at the Faculty of Medicine, Universitas Indonesia (FMUI) since 1980. She graduated as Medical Doctor from FMUI in 1968. She then started her specialty in the field of ophthalmology in Rumah Sakit Cipto Mangunkusumo (RSCM) in 1979–1988. At the same time, she also became the Coordinator of Research in Department of Ophthalmology, FMUI—RSCM. In 2008–2009, she was chosen as the head of Medical Research Unit FMUI—RSCM. She is also well-known in the international world, as a member as well as an editor of *Orbita International Magazine* since 1985 to present. Currently she is the Minister of Health of Indonesia in President Joko Widodo's Cabinet.



Prof. Lilian M. Azzopardi—*Head, Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Malta*

Prof. Lilian M. Azzopardi studied pharmacy at the University of Malta, Faculty of Medicine and Surgery and in 1994 she took up a position at the Department of Pharmacy, University of Malta. Prof. Azzopardi is the Head of School of Pharmacy at the University of Malta and co-ordinates the teaching of pharmacy practice. She has spearheaded major developments in pharmacy education within the University of Malta including the development of a post-graduate doctorate in pharmacy offered by the University of Malta in collaboration with the University of Illinois at Chicago. She has been invited as an external examiner for postgraduate degrees in different schools of pharmacy internationally. Her research portfolio is in the area of pharmacy quality systems and pharmacist interventions in clinical settings. She has published several papers and has been invited to give lecturers

and short courses in several universities. She has received awards by the International Pharmaceutical Federation (FIP) and the European Society of Clinical Pharmacy. In 2014 she was elected as President of the European Association of Faculties of Pharmacy. She was co-chair of the working group of the FIP Nanjing Statements on Pharmacy and Pharmaceutical Sciences Education launched in 2016.



Prof. Joseph T. DiPiro—*Dean, Professor and Archie O. McCalley Chair at the Virginia Commonwealth University School of Pharmacy, Richmond, Virginia, USA*

Prof. Joseph T. DiPiro is Dean, Professor and Archie O. McCalley Chair at the Virginia Commonwealth University School of Pharmacy, Richmond, Virginia, USA. He received his BS in pharmacy (Honors College) from the University of Connecticut and Doctor of Pharmacy from the University of Kentucky. He served a residency at the University of Kentucky Medical Center and a fellowship in Clinical Immunology at Johns Hopkins University. He is President of the American Association of Colleges of Pharmacy and Past Chair of the Council of Deans. He has also served as President of the American College of Clinical Pharmacy. In 2002, he received the AACP

Robert K. Chalmers Distinguished Educator Award. He has also received the Russell R. Miller Literature Award and the Education Award from ACCP. In 2013 he was the national Rho Chi Distinguished Lecturer. Dr. DiPiro was elected a Fellow in the American Association for the Advancement of Science. Dr. DiPiro is a past Editor of The American Journal of Pharmaceutical Education. He is an editor for *Pharmacotherapy: A Pathophysiologic Approach*, now in its 10th edition. He is also the author of *Concepts in Clinical Pharmacokinetics* and Editor of the *Encyclopedia of Clinical Pharmacy*. He has published over 200 journal papers, books, book chapters, and editorials in academic and professional journals.



Prof. Charles F. Lacy—Professor of Pharmacy Practice and Vice President of Roseman University of Health Sciences, Henderson, Nevada, USA

Prof. Charles F. Lacy, Pharm.D., MS., FASHP, FCSHP, BCPP, CAATS is Professor of Pharmacy Practice and Vice-President of Roseman University of Health Sciences. He co-founded the university with his co-founders, Dr. Renee Coffman (President) and Dr. Harry Rosenberg (President emeritus). He has practiced clinical pharmacy and taught at numerous universities over the past 35 years. He was the Clinical Coordinator of Pharmacy Services at Cedars-Sinai for 20 years. He has specialized in numerous areas over the years, including psychiatric and neurologic pharmacy, oncology and informatics. He is the lead author of the renowned “Drug Information Handbook” and lead editor of the Lexi-Comp Clinical Reference Library. Dr. Lacy is a recognized leader in Pharmacy- he has worked with numerous Pharmacy & Therapeutics (P&T) Committees at the state and national level,

and has lead focus groups and task-forces in the areas of pharmacoeconomics, team building, complementary medicine, and medication therapy management throughout much of the world.

Plenary speakers



Prof. Michael D. Katz—*Professor at Department of Pharmacy Practice & Science, The University of Arizona College of Pharmacy, USA*

Prof. Michael D. Katz is Professor at the University of Arizona College of Pharmacy Department of Pharmacy Practice & Science. He practices at the University of Arizona Medical Center within the Department of Internal Medicine. His practice interests include general internal medicine, endocrinology, HIV/AIDS, infectious diseases, and evidence-based practice. Dr. Katz teaches pharmacy and medical students in both the classroom and experiential settings. He was selected in 2001 as a Dean's Teaching Scholar by the Arizona Health Sciences Center and has received numerous teaching awards. He is a Past-Chair of the American Society of Health-System Pharmacists (ASHP) Commission on Therapeutics. Dr. Katz has numerous publications and including *Pharmacotherapy Principles and Practices Study Guide: A Case-Based Care Plan Approach*, now in its fourth edition.

Dr. Katz is the Internal Medicine PGY2 Residency Program Director and directs all residency-related activities for the College of Pharmacy. He has been involved in international education and practice for even 15 years and he serves as the College of Pharmacy's Director of International Programs. In 2010 he received the University of Arizona's prestigious Excellence in International Education Award. He has consulted and lectured extensively in Japan and many other countries regarding pharmacy education and clinical pharmacy practice and he serves as the Co-Chair of the Board of Directors of the U.S—Thai Pharmacy Consortium. Dr. Katz directs the largest program of its kind to train clinical pharmacy faculty members from Saudi Arabia.



Dr. Umi Athiyah—*Al/Prof of Department of Pharmacy Practice and Dean of Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia*

Dr. Umi Athiyah is the current dean of Faculty of Pharmacy at University of Airlangga, Indonesia. Dr. Athiyah teaches various subjects including Pharmaceutical Philosophy, Community Pharmacy, Law and Ethics in Pharmacy, Management of Pharmacy Services and Logistics, Professional Communication, Pharmacoeconomics, Information Technology and Pharmaceutical Marketing. She has a research interest in Pharmacy Practice and Health Care System. She has been involved in many community based services. She has been invited as a speaker both in national and international conferences. She is one of the co-authors of a Pharmacy Management handbook.



Prof. Alan Lau—*Professor of Pharmacy Practice and Director of International Clinical Pharmacy Education at the University of Illinois at Chicago (UIC) College of Pharmacy, USA*

Prof. Alan Lau is Professor of Pharmacy Practice and Director of International Clinical Pharmacy Education at the University of Illinois at Chicago (UIC) College of Pharmacy. He obtained his Bachelor of Science in Pharmacy and Doctor of Pharmacy degrees at the State University of New York at Buffalo and then completed a clinical pharmacy residency at UIC. He pioneered the development of clinical pharmacy services for renal failure patients on dialysis. Dr. Lau had obtained many research grants for clinical and laboratory research in renal pharmacotherapeutics and clinical pharmacology, with a recent focus on mineral and bone disorder in chronic kidney disease. He has published many research papers and book chapters, including chapters in the textbooks *Pharmacotherapy, Applied Therapeutics—*

The Clinical Use of Drugs and Basic Skills in Interpreting Laboratory Data. Dr. Lau was one of the founding members of the Nephrology Practice and Research Network of the American College of Clinical Pharmacy. In addition, he had served on the Board of Director and as Chairman of the Renal Scientific Section in the American Society for Clinical Pharmacology and Therapeutics. Dr. Lau was elected to be vice-chairman of the Nephrology/Urology Expert Committee of United States Pharmacopeia (USP) in 2007. In 2010, he was elected as a Distinguished Practitioner to the National Academies of Practice in Pharmacy. Since 2011, Dr. Lau has been working with the American College of Clinical Pharmacy on international program development and is now the International Program Director. He also has been appointed guest professor/faculty at the National Taiwan University, University of Hong Kong, University of Malta and also the Central South University in Changsha, China. Dr. Lau has been invited to give lectures on pharmacotherapy and clinical pharmacy service development in many countries, including Japan, South Korea, China, Hong Kong, Taiwan, Thailand, Vietnam, Malaysia, Singapore, Philippines, Indonesia, Saudi Arabia, Turkey and Malta.



Prof. Roger Lander—*Professor of Pharmacy Practice at Samford University, in Birmingham, Alabama, USA*

Prof. Roger Lander currently serves as Professor of Pharmacy Practice at Samford University, in Birmingham, Alabama, USA. He received his B.S. in Pharmacy and Pharm.D. from the University of Missouri-Kansas City and completed a clinical pharmacy residency program at Truman Medical Center. He then served as a faculty member at UMKC's Schools of Medicine and Pharmacy. Moving to Samford in 1986, he has developed practices in adult medicine, nutrition, ambulatory care, and pharmacokinetics. He previously served as Vice-Chair, Chair and Assistant Dean for Practice Programs. In 1994, Professor Lander helped develop a clerkship for Samford students at Guy's and St. Thomas' Hospitals in London and assisted the pharmacy there in the development of their ambulatory anticoagulation services. Professor Lander helped establish Samford's faculty/student

exchange program with Meijo University in Nagoya, Japan and has traveled widely throughout Asia for information exchange and to assist colleges and hospitals in their clinical teaching and practice. He helped develop study opportunities at Samford for pharmacists from England, Japan, Korea, China, Malaysia, Indonesia, and Vietnam. Dr. Lander is one of the founders of the Asian Conference on Clinical Pharmacy. He has traveled to Indonesia at least a dozen times to assist pharmacists in their practice development.

List of symposium speakers

SYMPOSIUM 1: DEVELOPING CLINICAL PHARMACY

- Prof. Charles D. Sands—*Former Dean and Professor (retired), McWhorter School of Pharmacy, College of Health Sciences, Samford University, Birmingham, Alabama, USA*
- Dr. Surakit Nathisuwan—*Associate Professor in Clinical Pharmacy in Clinical Pharmacy Division, Department of Pharmacy, Faculty of Pharmacy, Mahidol University, Bangkok, Thailand*
- Ms. Nor Hasni Bt Haron—*Senior Principal Assistant Director Pharmaceutical Services Division, Ministry of Health of Malaysia*
- Dr. Budi Suprapti—*Al/Prof at Department of Clinical Pharmacy, Faculty of Pharmacy, Universitas Airlangga. Head of Pharmacy Department at Universitas Airlangga Teaching Hospital, Surabaya, Indonesia*
- Dr. Margaret Choye—*Clinical Assistant Professor at College of Pharmacy, the University of Illinois at Chicago, USA. Clinical Pharmacist in Internal Medicine at the University of Illinois at Chicago Hospital and Health System, USA*

SYMPOSIUM 2: ADVANCED PRACTICE 1

- Dr. Hiroyuki Kamei—*Office of Clinical Pharmacy Practice and Health Care Management, Faculty of Pharmacy, Meijo University, Nagoya, Japan*
- Dr. Hanna Sung—*University of the Pacific, Thomas J. Long, School of Pharmacy and Health Sciences in California, USA*
- Dr. Alexandre Chan—*Deputy Head and a tenured Associate Professor at the Department of Pharmacy, Faculty of Science at National University of Singapore (NUS) and the Duke-NUS Medical School, Singapore*
- Prof. Jae Wook Yang—*Professor and Director of the Institute of Clinical Research and Practice, College of Pharmacy, Sahmyook University & Vice President of Korean College of Clinical Pharmacy*
- Prof. Dr. Syed Azhar Syed Sulaiman—*Professor at School of Pharmaceutical Sciences at University Sains Malaysia, Penang, Malaysia*

SYMPOSIUM 3: MOLECULAR PHARMACOLOGY AND PHARMACOGENOMICS

- Dr. Mehdi Rajabi—*Clinical Pharmacy and Pharmacy Practice, Islamic Azad University, Pharmaceutical Sciences Branch, Tehran, Iran. Clinical Pharmacist, Member of General Pharmaceutical Council of Great Britain*
- Mrs. Fan Zhang—*Lanzhou University, a Pharmacist-in-Charge at Pharmacy Department of the First Hospital of Lanzhou University in China*
- Dr. Lunawati Bennet—*Assoc. Professor of Pharmaceutical Sciences at Union University School of Pharmacy in Jackson, Tennessee, USA*
- Prof. Robert D. Sindelar—*Professor and former Dean of Faculty of Pharmaceutical Sciences, University of British Columbia; and Advisor, External relations, Centre for Health Evaluation & Outcomes Sciences (CHEOS), Providence Health Care research Institute and University of British Columbia, Canada*
- Dr. Baharudin Ibrahim—*School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia*

SYMPOSIUM 4: INTERPROFESSIONAL EDUCATION

- Dr. Christine B. Teng—*Assoc. Professor of Department of Pharmacy, National University of Singapore Principal Pharmacist (Clinical), Dept of Pharmacy, Tan Tock Seng Hospital, Singapore*
- Mr. Tan Wee Jin—*Principle Pharmacist at Guardian Health & Beauty, Singapore*
- Dr. Ching Jou Lim—*Senior lecturer in the Discipline of Social and Administrative Pharmacy, University Sains Malaysia, Malaysia*
- Mr. Mac Ardy J. Gloria—*University of the Philippines, The Philippines*
- Dr. Vivian Lee Wing Yan—*Assoc. Professor of the School of Pharmacy and the Assistant Dean (Student Development) of the Faculty of Medicine, Chinese University of Hong Kong*

SYMPOSIUM 5: ADVANCED PRACTICE 2

- Prof. Timothy E. Welty—*Professor and Chair of Clinical Science in the College of Pharmacy and Health Sciences at Drake University, Iowa, USA*
- Dr. Takao Shimazoe—*Department of Clinical Pharmacy and Pharmaceutical Care, Graduate School of Pharmaceutical Sciences, Kyushu University, Fukuoka, Japan*
- Prof. Zhou Quan—*Professor and Vice Dean of Department of Pharmacy, The Second Affiliated Hospital of Zhejiang University, China*
- Prof. Sukhyang Lee—*Professor of Clinical Pharmacy at College of Pharmacy, Ajou University, Korea*
- Prof. Kheirollah Gholami—*Professor and Chairman at the Department of Clinical Pharmacy, College of Pharmacy, Iran*

SYMPOSIUM 6: HEALTH CARE DELIVERY IN COMMUNITY PHARMACY

- Prof. Michael D. Hogue—*Assoc. Dean for the Center for Faith and Health at Samford University's College of Health Sciences, Birmingham, Alabama, USA*
- Dr. Elida Zairina—*Senior lecturer of Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia*
- Ms. Leonila M. Ocampo—*Chairman of the Hygieian Insitute for Education, research and Training Inc, The Philippines*
- Ms. Yong Pei Chean—*Senior Manager, Khoo Teck Puat Hospital and Council Member, Pharmaceutical Society of Singapore*
- Drs. Saleh Rustandi—*Chairman of Himpunan Seminari Farmasi Masyarakat (HISFARMA) of Indonesia*

SYMPOSIUM 7: PHARMACY EDUCATION

- Dr. Takashi Egawa—*Clinical Pharmaceutics and Health Sciences, Department of Pharmaceutical and Health Care Management, Faculty of Pharmaceutical Sciences, Fukuoka University, Fukuoka, Japan*
- Prof. Yolanda R. Robles—*Professor and former Dean College of Pharmacy, University of the Philippines*
- Prof. Rong-sheng Zhao—*Professor in Peking University Third Hospital, China. Assistant to President, Deputy-Director in Pharmacy Department of Peking University Third Hospital, China*
- Dr. Manit Saetewa—*Staff of Faculty of Pharmaceutical Sciences, Ubon Ratchathani University, Thailand*
- Drs. Nurul Falah Eddy Pariang—*President of Indonesian Pharmacist Association, Indonesia*
- Prof. Joseph T. Dipiro—*Dean, Professor and Archie O. McCalley Chair at the Virginia Commonwealth University, School of Pharmacy, Richmond, Virginia, USA*

SYMPOSIUM 8: ADVANCED PRACTICE 3

- Dr. Daraporn Rungprai—*Academic Staff of Faculty of Pharmacy, Silpakorn University, Thailand*
- Ms. Hong Yen NG—*President, 110th Council, Pharmaceutical Society of Singapore Specialist Pharmacist (Oncology), Singapore General Hospital*
- Prof. Agung Endro Nugroho—*Professor of Department of Pharmacology and Dean of Faculty of Pharmacy, Universitas Gadjah Mada, Yogyakarta, Indonesia*

- Dr. Farshad Hashemian—*Assoc. Professor at Islamic Azad University, Pharmaceutical Sciences Branch, Tehran, Iran*
- Dr. Junaidi Khotib—*Assoc. Professor of Department of Clinical Pharmacy at Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia*

SYMPOSIUM 9: IMPROVING PATIENT MEDICATION SAFETY

- Dr. Wimon Anansakunwatt—*Siriraj Hospital, Thailand*
- Mr. Mohammed Nazri Abdul Ghani—*Principal Pharmacist and Medication Safety Officer (MSO) of KK Women's & Children Hospital, Singapore*
- Ms. Yoon Sook Cho—*Director of Pharmacy Department, Seoul National University Hospital, Korea*
- Dr. Sutthiporn Pattharachayakul—*Assistant Professor at the Department of Clinical Pharmacy, Prince of Songkla University, Thailand*
- Dra Mariyatul Qibtiyah—*Head of Paediatric Pharmacy Services at Dr Soetomo Hospital, Surabaya, Indonesia*
- Prof. Charles F. Lacy—*Professor of Pharmacy Practice and Vice President of Roseman University of Health Sciences, Henderson, Nevada, USA*



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Medication management system in several care homes in Surabaya

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ABSTRACT: In this cross-sectional study, we aimed to observe the medication management system in several care homes in Surabaya. A total of five care homes for the elderly participated in this study. There were 196 residents and 25 caregivers who agreed to participate in this study. The abilities of the residents to read the drug label, open the strip and blister of the medicine, open a bottle of liquid medicine, and measure the liquid medicine were 53.6%, 62.2%, 70.4%, 58.7%, and 28.1%, respectively. The storage conditions met the requirement, and all medicines were disposed after their expiry dates. Of the five care homes, one was practicing improper disposal of expired medicines. These practices have severely affected the medication management system of care homes. However, there are much scope for improvement especially in caregiver skills and residents' ability to manage medication.

1 INTRODUCTION

Physiological changes experienced by the elderly make them susceptible to health problems, such as hypertension, diabetes mellitus, chronic bronchitis, decreased muscle strength, and other health disorders (Harman 1990). In 2013, results of a Health Research showed that the prevalence of diabetes in East Java is 2.5% (total sample = 1,027,763), 12.8% of whom are in the age group ≥ 55 years, whereas the prevalence of hypertension is 26.2%, with 75.3% in the age group of ≥ 55 years. This situation requires improving long-term healthcare needs that focus on improving quality of life for the elderly.

A study conducted by Hoirun Nisa (2006) in several care homes for the elderly in Jakarta found that 77.47% of respondents (total 182 respondents) had health problems, most commonly headaches (41.84%), while 57.14% of respondents had a comorbid disease, with hypertension being the most prevalently found health issue in most respondents (53.85%). Another study in Tresna Werdha Khusnul Khotimah care home in Pekanbaru found that all residents were experiencing at least one health problem, such as arthritis, gout, hypertension, hypotension, pulmonary disease, asthma, gastritis, cataracts, or dermatitis (Zulfritri 2011). As a consequence, the elderly received drug therapy.

Marek and Antle reported that the elderly have poor self-medication management, which is often associated with their poor eyesight and limited movement. A study found that 28% of the elderly

did not close the pill bottles tightly so as to open them easily the next time, while 47% admitted difficulty reading the label due to poor eyesight, meaning they were not able to read the instructions in English or because the font size was too small (Marek & Antle 2008). Meanwhile, studies on three nursing homes in the Netherlands with 180 residents found that the most common causes of drug use error was the lack of supervision of nurses on drug use by the elderly, with nursing errors undermining the fact that the drugs should be taken with a glass of water. Other causes found included inappropriate time to take medication, such as 1 h early or later (Van den Bemt et al. 2009).

Care home facilities and services provided will have an impact on efforts to improve the health status of the elderly and eventually improve their quality of life. One of the main reasons that affect the quality of service is the number of caregivers provided and their level of education. The responsibilities of a caregiver are to help the elderly in performing daily activities and managing their medication. Research conducted by The Care Homes Use of Medicines (CHUMS) showed that number of staff and their skillset and training may be an important determinant of the misuse of drugs.

On the basis of the above considerations, this study aimed to identify the medication management profile of the elderly in several care homes in Surabaya, including how they obtain, use, store, and dispose the drug. We also observed the profile of caregivers as well as their involvement in managing the medication for the elderly.

2 METHODS

This was a cross-sectional and observational study with data retrieval method being a non-guided interview. This study was conducted in five care homes for the elderly in Surabaya, and the respondents were the residents and caregivers.

The variables of this study include:

1. Information related to patient demographics, namely gender, age, education level, number of health problems in the past week, and the number of drugs used in the past week;
2. Related information of caregiver demographics are gender, age, and education level;
3. How to get medication;
4. How to use the drug; in this case, the ability to use drugs, including the ability to open a bottle of medicine, open a strip and blister of the medicine, pour and measure the liquid preparation, as well as to read the drug label;
5. How to store drugs;
6. How to dispose unused medicine.

Sociodemographic data were obtained through a questionnaire that explored how the personal conditions of both the elderly and the caregiver can affect the elderly's medicine management. In addition, we also used an instrument in the form of an interview guide containing open-ended questions, which reflected on the management of daily medication by the elderly as well as caregivers. The interview results were written in a data-processing sheet to be analyzed using descriptive statistics tools such as SPSS software ver.17 and Microsoft Excel 2010.

3 RESULTS AND DISCUSSION

Data were validated with such content and by expert review. The questionnaire was then revised on the advice of these experts who were lecturers in the Faculty of Pharmacy, Universitas Airlangga. The interviewers were trained before collecting data. Questionnaires were tested on 26 respondents consisting of 6 elderly and 20 caregivers, and all questions could be easily understood by the study subjects.

As shown in [Table 1](#), care homes were divided into three groups, namely publicly owned (care home C), privately owned for-profit organizations (care homes A and D), and privately owned non-profit organizations (care homes B and E). In publicly owned and privately owned for-profit organizations, the medication management was conducted by care home staff, whereas in privately owned non-profit organizations, the majority of medication management was conducted by the

Table 1. Profile of care homes.

Care home profile		(%)
Type of care home ownership	Public	1 (20)
	Private for-profit organizations	2 (40)
	Private non-profit organizations	2 (40)
Type of care	Residential only	1 (20)
	Nursing only	0
	Mixed	4 (80)
Number of residents (person)	Care home A	71
	Care home B	29
	Care home C	50
	Care home D	39
	Care home E	20
Number of caregivers (person)	Care home A	12
	Care home B	3
	Care home C	10
	Care home D	3
	Care home E	2
Ratio of residents to caregiver (person)	Care home A	6:1
	Care home B	10:1
	Care home C	5:1
	Care home D	13:1
	Care home E	10:1
Medication management	Caregiver only	2 (40)
	Resident only	0
	Mixed	3 (60)
Training for caregivers	Available	0
	Not available	5

residents themselves. The ratio of residents to caregivers varied, ranging from 1 caregiver for 5 residents to 1 caregiver for 13 residents. None of the care homes trained their caregivers in managing residents' medication.

A total of 196 residents agreed to participate in this study. Characteristics of the residents are presented in [Table 2](#). The majority of residents were female (76.5%), and 34.7% were aged 60–70 years. A proportion of 50% of residents had low education and 15% were illiterate. These conditions may have contributed to the number of inappropriate self-medication management practices among them.

According to [Table 2](#), residents had experienced one to six health problems in the preceding week, and the average number of health problems found in one resident was 2. The decline in physiological function in the elderly makes them susceptible to disease and stress (Harman 1990, WHO 2016).

The increasing number of diseases has encouraged the use of drugs in the elderly. As can be seen in [Table 2](#), it is known that 174 out of 196 residents (88.8%) have used medicine, and the average number of medicine taken by one resident was 3 in

Table 2. Characteristics of the residents.

Residents' characteristics		n (%)
Gender (n = 196)	Male	46 (23.5)
	Female	150 (76.5)
Age (years), (n = 196)	Unknown	18 (9.2)
	60–70	68 (34.7)
	71–80	48 (24.5)
	81–90	49 (25.0)
	91–100	12 (6.1)
	101–110	0 (0)
	111–120	1 (0.5)
Mean no. of health problems per resident (95% CI)		1.8(1.3–2.3)
Median no. of health problems per resident (range)		4 (1–6)
Mean no. of medicines per resident (95% CI)		3(2.5–3.5)
Median no. of medicines per resident (range)		5 (1–9)
Medication management (n = 174)*	Self	19 (10.9)
	Caregiver	155 (90.2%)
Medicine and how to obtain it (n = 670) (%)	Non-prescription	94 (14.0%)
	Prescribed	576 (86.0%)
Level of education	Illiterate	15 (7.7)
	Not graduated from elementary school	41 (20.9)
	Elementary school	36 (18.4)
	Junior high school	21 (10.7)
	Senior high school	43 (21.9)
	College	40 (20.4)
	Total	196 (100)

*A total of 22 residents did not use any medicine.

the past week. The higher the number of medicine a person consumes, the higher will be the drug costs, risk of drug side effects, and risk of non-compliance (Indonesian Food and Drug Supervisory Agency 2008). According to Debra et al., poly-pharmacy is a major risk factor for the incidence of medication error. The risk is increased by 5% for each additional medicine (Debra et al. 2008).

Almost all medicines used by the elderly were prescribed by physician (86.0%). Only a small number of drugs were non-prescription medicines (see Table 2). Usually, the non-prescription medicines were obtained from visiting family or from the caregiver (dispensary at care home).

There are more than 20 health problems experienced by the elderly in care homes. Hypertension, pain, hyperlipidemia, dry and itching skin, and hyperuricemia were the five most health problems. Another health problem experienced by the elderly is pain. Information about health problems is provided in Table 3. These findings were similar to the

Table 3. Health problems of the elderly.

No.	Health problems	n (%)
1	Hypertension	71 (20.4)
2	Pain	68 (19.5)
3	Hyperlipidemia	23 (6.6)
4	Dry and itching skin	22 (6.3)
5	Hyperuricemia	19 (5.5)
6	Diabetes mellitus	17 (4.9)
7	Cough and cold	17 (4.9)
8	Dementia	15 (4.3)
9	Cardiovascular disease	11 (3.2)
10	Cataract	9 (2.6)
11	Diarrhea	9 (2.6)
12	Neurodisorder	8 (2.3)
13	Mobility difficulties	7 (2.0)
14	Infectious disease	7 (2.0)
15	Mental disorder	5 (1.4)
16	Other (asthma, hearing impairment, vomiting, bone fracture, gastritis, etc.)	40 (11.5)
	Total	348 (100)*

*One resident may suffer from more than one health problem.

results of the research conducted in Pune, India, reported in 2013, with respondents aged ≥ 60 years (Thakur et al. 2013).

There were 4.3% of residents with dementia. Specialized knowledge and skills are necessary to deal with dementia patients. Caregiver should be trained enough to provide appropriate care for residents with dementia. Another special health condition of residents that needs debriefing skills was mental disorder (1.4%). The existence of mental disorder patients at care home was quite alarming, because they required special facilities and treatment for their mental condition. Where possible, the elderly with mental disorder was proposed to be placed in a mental hospital.

Meanwhile, of the caregivers who helped the elderly manage their medication, the majority were women aged 20–30 years (68.0%) and had a college degree in health science (Table 4). Limited financial resources and the urgent need for a caregiver at care home have led to the management of care home hiring employees with inappropriate education. There were 8% of caregivers with low education level and 20% with medium education level.

The high responsibility of a caregiver should not contradict with the knowledge and skills. Limitations in caregivers in terms of education can be overcome by training them according to their job profile. On the basis of interviews with caregivers, there has never been training in medication management practice and counseling. Health

Table 4. Demographic profile of caregivers.

Category		N (%)
Gender	Male	6 (24)
	Female	19 (76)
Age (years)	Total	25 (100)
	20–30	17 (68)
	31–40	4 (16)
	41–50	3 (12)
	51–60	0 (0)
	>60	1 (4)
Level of education	Total	25 (100)
	Not graduated from elementary school	1 (4)
	Elementary school	0 (0)
	Junior high school	1 (4)
	Senior high school	5 (20)
	College in health science	17 (68)
	College in non-health science	1 (4)
	Total	25 (100)

Table 5. Medication management system profile of care homes.

Medication management system	Availability	n
Medicine procurement procedure	Available	0
	Unavailable	5
Medicine administration procedure	Available	1
	Unavailable	4
Storage of medicine procedure	Available	0
	Unavailable	5
Disposing of medicine procedure	Available	0
	Unavailable	5
Monitored dosage system	Available	3
	Unavailable	2
Patient medication record	Available	3
	Unavailable	2
Medication administration record	Available	5
	Unavailable	0
Affiliated pharmacy	Available	1
	Unavailable	4

personnel, especially pharmacists, can play a role in improving the quality of caregivers in managing medication at care homes for the elderly.

Medication management system in care homes is shown in Table 5. In general, guidelines for procurement, storage, and disposal of medicine were not provided at care homes. Only one care home provided medicine administration procedure. However, all care homes provided medication administration record.

As explained earlier, almost all drugs for the elderly were acquired by prescription (Table 2). Most of medicines were supplied by pharmacy (89.9%).

Table 6. Physical abilities of the elderly to use medicine.

	Opening packaging n (%)			Measuring liquid medication n (%)
	Blister	Strip	Bottle	
Able	138 (70.4)	122 (62.2)	115 (58.7)	55 (28.1)
Unable	58 (29.6)	74 (37.8)	81 (41.3)	141 (71.9)
Total	196 (100)	196 (100)	196 (100)	196 (100)

Furthermore, one care home cooperated with a pharmacy for its medicine supply. Prescriptions were given to the pharmacy and then the pharmacy personnel delivered the medicines to the care home. However, the standard operation procedure in medicine procurement was unavailable at all care homes (see Table 5).

The existence of a “dispensary” in institutions for the elderly should be a concern for health professionals, especially pharmacists. On the basis of the observations of researchers, drug procurement by a large numbers of caregivers is intended to be stock at care home. Procurement involves not only over-the-counter medicine but also medicine under prescription.

The physical condition of the elderly generally declines; however, patients need to do many things when using drugs, such as opening the packaging, pouring the preparations, preparation measures, and reading the drug label. Researchers asked residents to demonstrate opening different medicine packages as mentioned previously. The result was that almost half of the respondents (46.4%) were not able to read the text on the label or information on the medicine packaging. To ensure the correctness of medicine administration, reading the label or information on the packaging of medicine is important. Reading the instructions on the label prevents patients from medicine misuse and using wrong drugs, wrong dose, and wrong indications.

Table 6 presents the physical abilities of residents to read the drug label; open medicine package in the form of strips, blisters, and bottle cap of liquid medicine; and measure liquid medicine correctly. The abilities of residents to open medication blisters, strips, and liquid bottles and to measure liquid medicines accurately were 70.4%, 62.2%, 58.7%, and 28.1%, respectively (Table 6). It is evident from the table that the most difficult medicine packaging to be opened by the elderly was bottle. For solid preparations, unpacking a strip was found to be more difficult than unpacking a blister. Meanwhile, with regard to the ability to measure liquid preparations accurately, majority of residents could not accurately measure liquid medicine. Although more than 50% of the residents were able to open medicine packaging,

the inability to practice self-medication management by the elderly was quite evident. Therefore, the roles of competent caregivers are important to help the elderly use their medicine correctly.

This study found that the majority of the elderly (88.9%) did not experience difficulty in swallowing tablets with the aid of water. Only a few needed food to swallow, and a few others required crushing the tablets to swallow. With reduced saliva, the elderly may have difficulty swallowing medicines (Harman 1990).

The storage condition met the requirement criteria and all medicines were disposed after their expiration dates; however, one out of five nursing homes was practicing improper disposal of expired medicines.

There are two types of development policy regarding drug storage in care homes. Residents are allowed to store medicines in their room, and the other policy is that all medicines should be kept and managed by the caregiver. Meanwhile, for care homes that provide flexibility for the elderly to store their own medicine, drug storage containers become redundant. At one care home, almost all the medicines for the elderly were placed in a closet in a hot and stuffy room. This condition may affect drug stability, thereby reducing their effectiveness.

Furthermore, the drugs that are retained must be managed by the elderly. This can lead to new problems, namely the possibility of any indication in the elderly due to lack of knowledge about the reuse of old medicine. Drug misuse could happen because the elderly likely have memory loss and poor vision in reading information on the medicine packaging.

Care must be taken in the reuse of old drugs, because it requires considerable knowledge of medicine to guarantee the exact indication of dosage. Drugs that are damaged or expired should be destroyed before disposal. Several care homes always check the expiry dates and destroy the drugs before disposal. On the contrary, there were some care homes that do not destroy medicines before disposing them.

Caregivers in all care homes had never received training or counseling on proper disposal of medicines. This is where the role of pharmacists is important as they should be able to provide training related to the disposal of medicines so that drug managers in the Werdha can dispose drugs that are not used in the right way.

When interviewed about drug management constraints, caregivers reported the time of taking medicines as the most common problem. The low motivation of the elderly to take medicine is also a constraint that often occurs. The difficulty of delivering drugs on time is the most reported problem by caregivers (Table 7). As explained previously,

Table 7. Problems in managing medication by caregivers.

Problem	Frequency n (%)
Difficult to administer medication on time	15 (31.3)
Medicine refused to be taken by the elderly	10 (20.8)
Difficult to measure drugs (e.g., splitting tablets)	9 (18.8)
Difficult to crush tablets	6 (12.5)
Forgot to give medicine	3 (6.3)
Medicine asked by the elderly without any indication	2 (4.2)
None	3 (6.3)
Total	48 (100)

Table 8. Profile of medication errors.

Type of medication error	Who committed the error	
	Who committed the error	Frequency
Inappropriate indication	Resident	10
	Caregiver	33
Inappropriate dose	Resident	9
	Caregiver	12
Wrong time	Resident	2
	Caregiver	6

the ratio of residents to caregiver varied, ranging from 1 caregiver for 5 residents to 1 caregiver for 13 residents (Table 1). The limited number of caregivers compared to the number of elderly as well as the large number of caregiver tasks in delivering care aside from managing residents' medication, as well as the poor medication management system might be the root cause of the problems. Other constraints are presented in Table 7.

Further interview found medicine administration error committed by a caregiver with low education level. Previous research found that a caregiver can make mistakes such as wrong time of medicine intake (45%) and taking other residents' medicine (52%) (Szczepura et al. 2011).

Medication error profiles are presented in Table 8. Medication errors were committed by both caregivers and residents who practiced self-medication management. Low education level, lack of training, and heavy workload of caregiver have contributed to the incidence of medication error by caregiver (Barber et al. 2009, Szczepura et al. 2011). Meanwhile, the sources of medication error committed by residents were low education level, poor physical abilities such as vision impairment, mobility difficulties, and poor cognitive abilities (Marek et al. 2008).

A special case to note in the elderly is the difficulty of motivating the elderly to take medicine,

which is the second most severe problem experienced by caregivers. Overcoming this problem requires assistance of colleagues or a psychologist to find the reasons and how to motivate the elderly to take medicine.

In general, in addition to managing drugs for the elderly, caregivers are responsible for providing care for the daily activities of the elderly, such as eating, bathing, and other activities. Because of these various activities, caregivers may be less focused in recalling the time for the elderly to take their medication or they are unable to give the medication on time. This can be solved by practicing good medication management system, especially when administering regular medicines. Creating medication administration schedule includes time for medicine administration in the morning, noon, afternoon/evening or as often as needed. Other strategy is ringing a bell as a reminder for residents to take their medicine on time.

Other obstacles such as the difficulty in dividing and crushing the tablets can be overcome by providing mortar and pestle to grind the tablet as well as measuring the tablet if the desired amount is a fraction of the tablet. This reduces drug-related dose errors as well as facilitates the elderly in swallowing their tablet/capsule dosage form.

4 CONCLUSIONS

From the ability profile of the elderly, it can be concluded that the dependence of elderly people on caregivers to use drugs is relatively high. The training required for caregivers in managing medication at care homes is aimed at: (1) improving knowledge and skills in medication management for caregivers; (2) improving the quality of the medication management system in care homes; (3) using facilities to help the elderly use their medicine, especially to open medicine packaging, measure liquid medication, and provide the right medicine at the right dose for the right resident at the right time.

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Effects of audiovisual education on the knowledge and adherence of patients with DMT1

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ABSTRACT: Nonadherence to the treatment of diabetes mellitus still poses a problem to the management of the disease. Moreover, the adherence of patients with diabetes is influenced by knowledge. This quantitative study design is a one-group pretest–posttest to observe the effect of audiovisual education on the knowledge and adherence of patients with type 1 diabetes mellitus aged 11–19 years who were self-injecting insulin. Respondents were followed for 3 months using material education needed by patients according to the ISPAD guidelines. There were significant differences before and after audiovisual intervention with respect to the increase of adherence using a questionnaire ($p = 0.00$, $CI = 0.95$; $\alpha = 0.05$), with $p < 0.05$. Knowledge data of 22 patients with type 1 diabetes mellitus before and after education were collected by using the questionnaire, and the corresponding mean values were 5.36 ± 2.574 and 8.05 ± 2.299 ($p < 0.05$). We conclude that audiovisual education can affect the knowledge and adherence before and after education in adolescent patients with type 1 diabetes mellitus.

1 INTRODUCTION

According to the World Health Organization, diabetes mellitus is a metabolic disorder that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin that is produced. Insulin is a hormone that regulates blood sugar and consequently hyperglycemia is a common effect of uncontrolled diabetes and over time that leads to serious damage to many of the body's systems, especially the nerves and blood vessels. (WHO 2006) Insufficiency function of insulin can be due to disruption or deficiency of insulin production by Langerhans beta cell of the pancreatic gland (type 1 diabetes mellitus) (WHO 2006). Most cases are primarily due to T-cell-mediated pancreatic islet β -cell destruction, which occurs at different rates. There are usually serological markers of an autoimmune pathologic process, including islet cell antibodies (ICA), insulin autoantibodies (IAA), glutamic acid decarboxylase

(GAD), insulinoma-associated 2 molecule (IA-2), and zinc transporter 8 (ZnT-8) (Craig et al. 2011).

Effects of diabetes mellitus can be seen from uncontrolled blood glucose, which increases the cost of therapy and other complications (Salas et al. 2009). Because of the high prevalence of diabetes mellitus and its complications, diabetes control is an important component of the program's healthcare system by providing education about diabetes. Knowledge of medication is an important step in the self-management process of adolescent patients with diabetes mellitus (Farsaei et al. 2011).

According to the International Society for Pediatric and Adolescent Diabetes (ISPAD) Clinical Practice Consensus Guidelines, approximately 90% of patients with diabetes mellitus patients in Western countries have type 1 diabetes mellitus including children and adolescents diagnosed before 15 years of age (Craig et al. 2011). In some Indonesian hospitals, many patients with DMT1 have been helped by communities to improve their quality of life.

In children with type 1 diabetes mellitus, most of complications are hypoglycemia and ketoacidosis diabetes, which are caused by nonadherence to diabetes therapy. (NICE 2010: 9–29) Adherence to diabetes treatment can be increased by providing education, which is important in diabetes management. This intervention can improve patients' knowledge about the disease and its treatment (Osterberg & Blaschke 2005).

Pharmaceutical care has changed from drug-oriented to patient-oriented (MENKES 2008: 1–55). Pharmacists as health professionals are responsible for educating patients, in order to reduce morbidity and mortality in patients with DMT1 (Blekin-sopp et al. 2000, WHO 2005 4–30).

According to a systematic review, the management therapy of pharmacy community service and educating patients with diabetes mellitus can improve long-term outcome in blood glucose profile, instead of patients who only received standard therapy without pharmaceutical care (Chisholm-Burns et al. 2010). The understanding of treatment instruction for patient safety can change patients' habits to improve their adherence to treatment (Apsden et al. 2006). Some studies on audiovisual education resulted in positive outcomes to control blood sugar levels of patients (Glazier et al. 2006). These studies found that patients can forget 72% of all oral information given by healthcare professionals (Houts et al. 2006).

2 METHODS

2.1 Study population

The inclusion criteria were patients with type 1 diabetes mellitus aged 11–19 years who were self-injecting insulin and willing to participate in this research, able to communicate in Indonesian, literate, and did not have hearing impairment and communication problems.

2.2 Method of the study

This study was a quantitative research by one-group pretest–posttest. In this study, researchers wanted to know the effect of education by using audiovisual media in patients with DMT1 aging 11–19 years. The intervention was audiovisual education technique.

Education material contained the definition of type 1 diabetes mellitus, management of the disease such as monitoring the blood glucose, healthy lifestyle, physical activity, insulin treatment, and complications (hypoglycemia and DKA), and how to control it. Review of the education provided was performed every month during the study.

Audiovisual education was given face to face to patients with type 1 diabetes mellitus by using simple animation. The samples in this study must followed audiovisual educational intervention for 3 months.

The study samples should be controlled by the doctor routinely once a month to receive education from pharmacists for 3 months as well as to fill up the adherence and knowledge questionnaires. Every 2 weeks, we monitored patients by phone to review the audiovisual education.

An audiovisual instrument validated by an expert doctor in methodology and statistics research, a pediatrician endocrine, and two clinical pharmacy staffs was used for the education intervention. Self-Care Inventory-Revised Version (SCI-R) questionnaire was used to observe the adherence (Weinger et al. 2005). Meanwhile, a modification of diabetes knowledge assessment (DKNA) was used to observe the knowledge of participants (Dunn et al. 1984). If the value of correlation coefficients is >0 , then it is considered as a valid question (Siregar 2013).

In this study, we used Wilcoxon's signed-rank test data analysis to determine the effect of education on the adherence and knowledge of patients before and after audiovisual education intervention. The questionnaire was performed using the Likert scales with values 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = every time. Paired *t*-test analysis determined the effect of education

Table 1. Demographics of patients with type 1 diabetes mellitus.

	Demographics (n = 22)	
	(Σ)	(%)
Gender		
Male	8	36.36
Female	14	63.64
Age (years)		
11–12	5	22.73
13–15	8	36.36
16–18	6	27.27
19	3	13.64
Level of education		
Elementary school	5	22.73
Junior high school	7	31.82
High school	9	40.91
College	1	4.54
Duration of illness (years)		
1–5	10	45.45
6–10	12	54.55
Insulin regimen		
Basal bolus insulin	11	50.00
Split-mixed insulin	11	50.00

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Insulin regimen		
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Split-mixed insulin	11	50.00

on the adherence before and after audiovisual education intervention.

Multivariate logistics regression was used to analyze the compounding factor in this study using the Nagelkerke R value. Statistics analysis was conducted using SPSS 20.0 programs for Windows.

3 RESULTS AND DISCUSSION

According to patient characteristics, of the total 50 patients, only 22 patients participated in this study. Three patients dropped out while 25 patients were not qualified to participate in this study.

3.1 Demographic characteristics

Most of the respondents were in the age group of 13–15 years (36.36%), with the majority were female (63.64%). Most of the respondents were high school graduates (40.91%), with the same type of insulin regimen between basal bolus insulin and *split-mixed* insulin (50%).

3.2 Quantitative research

The total number of patients participated in this study were less than 50; therefore, the Shapiro–Wilk test was used to analyze the data. The distribution is considered normal if $p > 0.05$ (Dahlan 2010). The p -value of adherence before and after education showed significance less than 0.05, means that the data was not normally distributed. The p -value of knowledge before and after education showed significance greater than 0.05, which shows that the data distribution was normal.

The analysis of adherence before and after education with Wilcoxon’s signed-rank test indicated the statistical significance level of $p = 0.001$. However, results of the knowledge data of patients with type I diabetes mellitus before and after education

for 3 months in 22 participants showed a significance level of $p < 0.05$ or $p = 0.00$.

3.3 Confounding analyses

The results of multivariate logistics regression analysis indicate that age, level of education, and duration of illness did not affect significantly patients’ knowledge, with $p > 0.05$ (age: $p = 0.26$ 95% CI 0.03–2.72 OR = 0.26; education level: $p = 0.27$ 95% CI 0.34–51.62 OR = 4.17; duration of illness: $p = 0.62$ 95% CI 0.05–6.33 OR = 0.54).

The first phase of this study was collected information about glycemic control of patients with type I diabetes mellitus through interviews. It was done in order for the patients to receive audiovisual material education, which will increase the knowledge of adolescent patients so as to improve their adherence to treatment.

In education research using a valid audiovisual method, we measured the adherence and knowledge of patients with type I diabetes mellitus by using questionnaire before and after education for 3 months. The results of Wilcoxon’s signed-rank test showed that the significance was $p = 0.001$ (CI = 0.95; $\alpha = 0.05$), which indicates a significant difference in adherence before and after intervention with average scores of 56.32 ± 9.95 are 62.95 ± 9.02 for pre-test and post-test, respectively. This finding was similar to that of other studies (Von Sengbusch et al. 2006, Couch et al. 2008, Kahana et al. 2008).

The result of paired t -test on knowledge with DKNA questionnaire found average pre-test and post-test scores of 5.36 ± 2.574 and 8.05 ± 2.299 , respectively, with significance of 0.00 (CI = 0.95; $\alpha = 0.05$), which indicates a significant difference in knowledge before and after intervention. Other studies found similar results, that is, there were differences in the level of knowledge before and after intervention (Von Sengbusch et al. 2006, Couch et al. 2008, Howe et al. 2005, Verrotti et al. 1993).

The results of logistics multivariate regression showed that knowledge and adherence in patients with type I diabetes mellitus were not influenced by others factor such as age, level of education, duration of illness, and insulin regimen. Nagelkerke R value of 0.15 showed the confounding factor of knowledge level of participants. The remaining analyses showed that the adherence is influenced by other factors with $p < 0.05$, because in this study, participant compliance variables showed higher values.

3.4 Limitations

This study has some limitations such as that the sample were not randomized, the short study

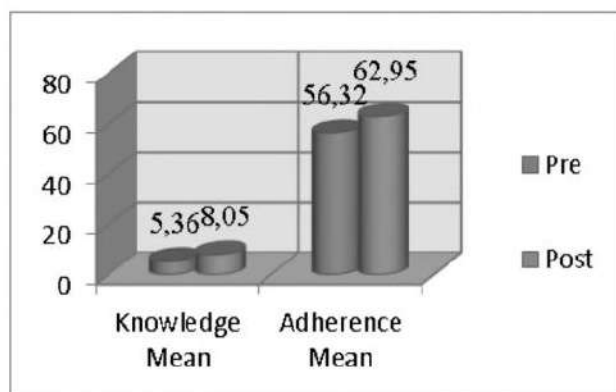


Figure 1. Mean knowledge data before and after education.