

Expert Opinion on Addressing the Gap in Injection Technique and Needle Reuse for People with Diabetes in Indonesia

Pradana Soewondo¹, Ketut Suastika², Ida Ayu Kshanti³, Mardianto Mardianto⁴, Sony Wibisono Mudjanarko⁵, R Bowo Pramono⁶, Dyah Erti Mustikawati⁷

¹Department of Internal Medicine, Faculty of Medicine, University of Indonesia, Cipto Mangunkusumo Hospital, Jakarta, Indonesia; ²Department of Internal Medicine, Faculty of Medicine, Udayana University, Prof. Dr. I.G.N.G Ngoerah General Hospital Denpasar, Bali, Indonesia; ³Department of Internal Medicine, Fatmawati General Hospital, Jakarta, Indonesia; ⁴Faculty of Medicine, University of Sumatra Utara/Adam Malik Central Hospital, Internal Medicine, Medan, Indonesia; ⁵Department of Internal Medicine, Faculty of Medicine Airlangga University, Dr. Soetomo General Academic Hospital, Surabaya, Indonesia; ⁶Department of Internal Medicine, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada/Dr. Sardjito General Hospital, Yogyakarta, Indonesia; ⁷Ministry of Health Republic of Indonesia, Jakarta, Indonesia

Correspondence: Pradana Soewondo, Division of Endocrinology, Department of Internal Medicine, Faculty of Medicine, University of Indonesia, Cipto Mangunkusumo Hospital, Jakarta, Indonesia, Tel +6221 390 7703, Email soewondops@yahoo.com

Abstract: The use of insulin for patients with diabetes mellitus in Indonesia appears to be under expectation; moreover, there are gaps in knowledge regarding the proper injection technique and pen needle reuse by both healthcare professionals (HCPs) and patients. To address these issues, a scientific expert meeting was held with the participation of endocrinologists and public health specialist from many different organizations in Indonesia to identify the challenges and problem related to injection technique, high pen needle reuse rate, and the need of all stakeholders. The experts agreed that it is necessary to ensure physicians to start the initiation phase as early as indicated, continue optimizing its dosage to reach targeted blood sugar based on guideline, and involve all relevant stakeholders to improve insulin distribution and patient access in every primary care facility in order to optimize the use of insulin or other injectable diabetes medications in Indonesia. Additionally, the experts believed that education on proper injection technique and improved reuse rate of pen needle is necessary. To date, Indonesian Diabetes Educators Association (IDEA/PEDI) has established guideline on injection technique. There are also recommendations on injection technique and needle reuse from Indonesian Society of Endocrinology (PERKENI) and Forum for Injection Technique & Therapy: Expert Recommendations (FITTER); however, this guideline/recommendation should be disseminated more widely among HCPs. In addition, cost-effectiveness studies based on local data are needed to propose and convince the Payors and other stakeholders. This article can be used as a guidance for HCPs and policymakers to improve current practice on injection technique, pen needle reuse, needle prescription and reimbursement policy in Indonesia and elsewhere.

Keywords: diabetes mellitus, expert opinion, GLP-1 receptor agonist, injection technique, insulin, needle reuse

Introduction

The Growing Burden of Diabetes: Current Situation and Implications in Indonesia

Diabetes mellitus (DM) is a non-communicable, chronic disease that has a significant impact on global health, resulting in a substantial burden on health care. According to the International Diabetes Federation (IDF), there were 536.6 million people with DM globally in 2021, and this number is predicted to increase to 783.2 million in 2045.¹ Moreover, Indonesia is still among the top five countries with nearly 20 million adults (aged 20–79) with diabetes in 2021, of which an estimated 73.7% people remain undiagnosed. As a result, diabetes-related health expenditures in Indonesia reached USD 6,302,400 in 2021, and these costs are projected to increase over the next 15 years due to the expected rise in the number of affected individuals.¹ The higher cost is also associated with poor glycemic control in people with diabetes (PWD), which may cause life-threatening complications leading to significant financial burden. Furthermore, PWD may

experience productivity losses, with 18% individuals more likely to lose >2 hours work per week, have increased absences per year and are significantly more likely to retire early.^{2,3}

Barriers to Insulin Therapy for People with Diabetes in Indonesia

The Indonesian Society of Endocrinology recommends initiating insulin therapy for existing PWD with HbA1c $\geq 7.5\%$ – $<9\%$ on dual/triple oral hypoglycemic agent as well as newly diagnosed PWD with HbA1c $\geq 9\%$ or fasting blood glucose ≥ 250 mg/dL or random blood glucose ≥ 300 mg/dL or with metabolic decompensation symptoms.⁴ Insulin initiation usually uses basal insulin, which works to maintain glycemic control in PWD by controlling hepatic glucose production.⁵ However, in Asia, insulin initiation appears to be delayed.⁵ Patient barriers, physician barriers, and infrastructural barriers seem to be the main factors.⁵ Patients are reluctant to use insulin because of many reasons including needle phobia, doubts about the efficacy of insulin, and misconception regarding insulin as terminal treatment. On the other hand, physician barriers often arise from the unfamiliarity with diabetes management and guidelines.⁵ To date, the number of endocrinologists in Indonesia is very low, only 135, with 33 endocrinology candidates compared to the growing number of PWD.⁶ Also, time constrain which consultation time is very limited from doctors, especially in primary care facilities due to a large number of patients.⁵ On the other hand, there are limited certified diabetes educators and only available big cities in Indonesia.

Inadequate health facilities related to the availability and storage of insulin (cold chain) widely throughout Indonesia were one of the challenges in initiating and sustainability of insulin therapy. Moreover, limited provision and lack of coverage for pen needles as well as syringes, glucometers, and glucose test strips by *Jaminan Kesehatan Nasional* (JKN), which is the national health insurance in Indonesia, further contribute to the existing challenges. This was evident in Nias Island, where most of the patients experienced poor glycemic control, despite relying on insulin, which is associated with non-adherence to treatment and may lead to diabetes complications.⁷ In Nias Island, frequent storms disrupted insulin supply, and the temperature monitor was not functional, highlighting the importance of regulating cold-chain management. The government and pharmacies are responsible for maintaining cold-chain management and insulin supply at healthcare facilities through JKN. JKN should not only monitor costs but also establish target goals and oversee insulin's cold-chain management. However, the responsibility of treating patients requiring insulin in Indonesia is shared by the Ministry of Health, House of Representatives of the Republic of Indonesia (DPR), physicians, hospitals, pharmacists, patients and their families, nurse educators, and other healthcare providers. In addition, other issues related to insulin use in Indonesia are the improper injection technique and repeated use of needles, resulting in pain for PWD.⁷

Implementing Proper Injection Techniques and Improved Needle Reuse Rate in Indonesia

Challenges in Injection Techniques

Study revealed that approximately 70% of the patients had insufficient awareness about injection technique.⁸ Aligned with the global data, according to preliminary survey with the experts (for the survey's method see section "Recommendations from the Advisory Board Meeting"), approximately one-third of their patients used needle more than six times and there was still $<25\%$ of their patients with adequate knowledge of injection technique. Improper injection technique and the choice of injection sites could alter insulin absorption, resulting in uncontrolled blood glucose levels (hyperglycemia/hypoglycemia), and lipohypertrophy (LH).^{8–10} These effects can also have economic implications for the healthcare system, especially in patients with LH who often require a higher dose of insulin.¹¹ In fact, implementing proper injection technique has been shown to reduce daily insulin doses by approximately 20%.¹²

Challenges in Improving Needle Reuse Rate

Globally, approximately half of the patients use their needle more than once.¹³ Reusing pen needle can cause needle breakage in the skin, clogging of the needles, inaccurate dosing, infection, and increasing pain for PWD.^{12,14} A study assessed needle tip deformity of insulin pen needles using 123 electron microscope pictures and reviewed by 3 blinded reviewers. The study revealed that reusing insulin pen needle up to five times did not increase needle tip deformity or

increase pain intensity. It also stated that needles should be changed if there is any local reaction at the injection site or if the needle feels blunt for general precaution.¹⁵ Reusing pen needles with incorrect site rotation can also result in skin LH, unexplained hypoglycemia, glycemic variability, and slightly high HbA1c levels.^{12,13}

PWD often reuse needles for convenience and to save money. Additionally, this is due to limited availability of pen needles or to prevent excess waste.¹³ Healthcare facilities in Indonesia typically provide only one or two needles, which usually are not covered by JKN, on top of the fact that insulin pens are only available at secondary levels of health care under JKN management. Thus, these conditions become an out-of-pocket expense for patients.^{6,7} These issues are related to needle prescription regulation in Indonesia according to the experts. The lack of clear regulation on needle prescription in Indonesia has impacted injection technique and the effectiveness of the drug, besides the length of the needle is related to proper injection technique. Similar issues exist in China, where patients without pen needle reimbursement have a greater economic burden compared to those with reimbursement.^{16,17}

The experts admitted that apart from the price, the patients lack awareness of the importance to change the needle after each use. This low awareness is consistent with the findings reported in other studies.^{14,18} Although physicians may be knowledgeable about insulin, they may not be as familiar with proper needle use and injection techniques. Therefore, providing guidelines and education are necessary to address these issues. Education about DM has been widely recognized as an effective approach to managing and preventing the DM.⁸

Recommendations from the Advisory Board Meeting

Six endocrinologists representing different organizations in Indonesia and one public health specialist from the Ministry of Health Republic of Indonesia convened in an advisory board meeting to address the challenges of injection technique and needle reuse rates in Indonesia, deliberating possible solutions. The organizations represented were Indonesian Society of Internal Medicine/*Perhimpunan Dokter Spesialis Penyakit Dalam Indonesia* (PAPDI), Indonesian Society of Endocrinology/*Perkumpulan Endokrinologi Indonesia* (PERKENI), Indonesian Diabetes Association/*Persatuan Diabetes Indonesia* (PERSADIA), Indonesian Diabetes Educators Association (IDEA)/*Perkumpulan Edukator Diabetes Indonesia* (PEDI). A review of related literature using a Medline and Google Scholar search with the following keywords was conducted: diabetes mellitus, injection technique, insulin, and needle reuse. A preliminary survey questionnaire was developed from the collected reference papers and conducted to identify shared challenges and collect initial feedback from the experts. The following are the main recommendations from all experts and summarized in Table 1.

Needs for Improving Guideline Implementation in Indonesia

Indonesia adopted the guidelines for needle use from the American Diabetes Association (ADA) and European Association for the Study of Diabetes (EASD) Guidelines. The guideline for proper injection technique has been established by Indonesian Diabetes Educators Association (IDEA/PEDI), titled “*Pedoman Teknik Menyuntik Obat Diabetes Indonesia 2023*”.¹⁹ This guideline describes injection sites, needle length, injection technique, injection angle, and frequency of needle change/puncture sites, which is summarized in Figure 1. Also, there is FITTER

Table 1 Recommendations from the Advisory Board Meeting

No.	Recommendations
1.	There is a need to enhance the knowledge and skills of HCPs in Indonesia to improve the use of insulin and other injectable diabetes medications through Continuing Medical Education (CME).
2.	The injection technique guidelines from PEDI, PERKENI, and FITTER need to be immediately disseminated among HCPs.
3.	HCPs must be aware of the importance of proper injection technique and educate their patients.
4.	It is necessary to carry out studies on the cost effectiveness of single use pen needle in Indonesia, systematic reviews, and other studies that can convince Payors and other stakeholders on their policies of pen needles.
5.	Strengthen collaboration between Lay group and medical associations to increase public and government awareness on pen needle prescribing regulation and reimburse policy.

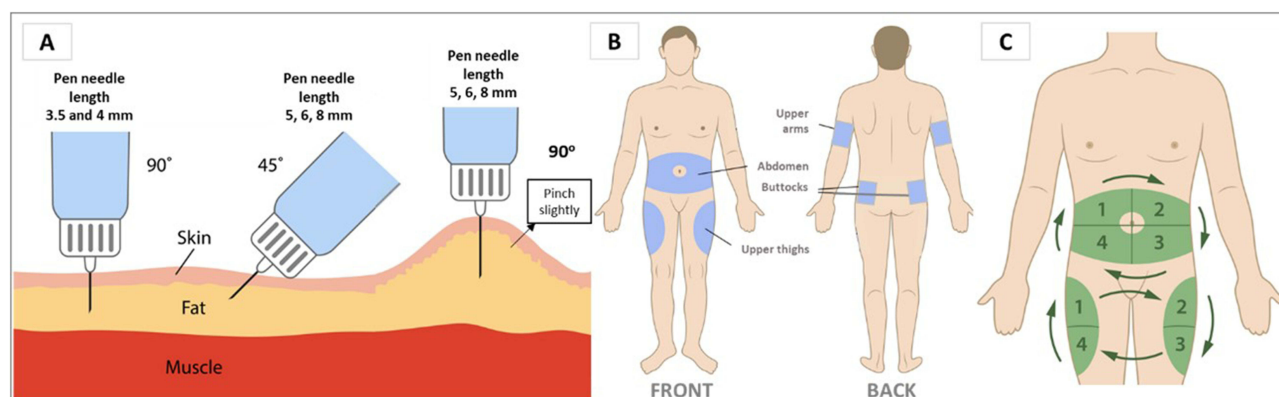


Figure 1 Proper Insulin Injection Technique Using Pen Needle. **(A)** needle length 3.5–4 mm: insert the needle into the skin quickly without pinching at a 90° angle to the area to be injected; needle length 5,6,8 mm: insert the needle at 45° angle without pinching or at 90° angle with pinch slightly. When the needle is inserted, press the piston slowly until the dose indicator shows “0”. Once the insulin is completely injected, allow the needle to remain in the skin for up to a count of 10. Then pull the needle out of the skin (if the skin is being pinched, release after the needle is pulled out of the skin). **(B)** Options of insulin injection sites. Front: abdomen (avoid injection <1 cm from umbilicus. The injection area may include 1 cm above pubic symphysis, 1 cm from the lowermost rib and the lateral abdominal wall), thighs (upper 1/3 of antero-lateral thigh). Back: arms (middle 1/3 of posterior upper arm), buttocks (use the lateral upper area). **(C)** Options of insulin injection rotation, which is important to avoid lipohypertrophy (LH) and to ensure optimal absorption. Injection site should be in one area and change site once a week with distance between sites ≥ 1 cm.¹⁹

(Forum for Injection Technique & Therapy: Expert Recommendations) as the “Golden Rules of Injection Technique” which have been developed by 183 diabetes experts from 54 countries supported by Becton Dickinson (BD) company to assist HCPs to help optimize diabetes treatment outcomes.²⁰ Both PEDI guideline and FITTER recommendation suggest the proper injection technique, single-use pen needle, and the use of 4-mm needles, which have been shown to cause less LH compared to the use of 8-mm needles.^{19,20} In addition, Indonesian Society of Endocrinology (PERKENI) has been publishing guideline regarding insulin therapy regularly, which comprises the injection technique.²¹ However, regulation on practicing needle prescription and reimbursement of pen needle in Indonesia still needs to be created. Currently, there are no specific government regulations governing the sales of insulin pen needles in Indonesia; instead, the existing regulations pertain to injection needle and syringes (Minister of Health Regulation Number 9 of 2017 regarding Pharmacies Article 17 and Minister of Health Regulation Number 229 of 1978 Article 4). In addition, there is no regulation on pen needle prescription by physicians. Consequently, insulin pen needles are currently readily available for purchase at pharmacies. However, this has implications for the safe usage of these pen needles. The pen needle length may not be determined definitively and will depend on patient’s choice or by the pharmacist. This variation in pen needle length can pose a safety concern, increasing the risk of intramuscular injections due to differing injection techniques. Reimbursement issues further complicate the matter, as pen needles can be acquired without a prescription, primarily benefiting patients with private health insurance. This is because private health insurance reimburses expenses based on a doctor’s prescription. Unfortunately, for patients with JKN insurance, insulin pen needles are not covered under the financing scheme, even if prescribed by the physicians. The experts suggested that this can be endorsed through collaboration between Lay group and professional society. Lay group can empower communities to improve public awareness and the government should issue regulation based on professions’ consensus.

Needs on Education for Injection Technique and Improve Needle Reuse Rate

According to the experts, education on injection technique including the selection of correct pen needle length and its size is important for HCPs who prescribe injectable diabetes medication, including internist non-endocrinologist, since their knowledge on this subject appears to vary. The experts also acknowledged that proper injection technique education should always be aligned with Continuing Medical Education (CME) or seminars on the use of insulin or other injectable diabetes medications. Patient education on comprehensive injection technique is essential; this includes the knowledge about needle length, reducing needle reuse, its potential consequences, injection site and rotation as well as handling injectable diabetes medication itself. Therefore, knowledge and awareness of HCPs on the injection technique is needed to educate patients. A study found that an education program increased the knowledge of PWD by 68.18% post-

education.²² Another study demonstrated that an intensive long-term educational approach resulted in a significant behavioural change with a 72% decrease in LH size at 12 months.¹² In addition, PWD who adopted the BD Micro-Fine™ 4mm 32G needles and received a joint educational program on injection technique (BD Educational Starter Kit) had a significant reduction of HbA1c by more than 75% in three months compared to those who used longer needles (5, 6, 8, 12.7 mm).¹¹ Educational interventions help patients enhance their knowledge and ability to manage diabetes.^{10,23} To facilitate the education, PEDI had made videos about injection technique that can be used and can be accessed for free on YouTube. Study shows that the use of video as an educational medium for injection technique resulted in an enhancement of knowledge and a positive change in attitude towards insulin therapy among individuals with DM. The use of educational videos is a beneficial strategy for improving long-term memory retention.²³ The experts also suggested spreading information about diabetes by using social media to open up more access for general population.

Physicians in primary care can effectively manage uncomplicated diabetes cases. Empowering primary care physicians on prescribing insulin or other injectable diabetes medications could be a cost-effective way to keep blood glucose under control and preventing long-term complications in PWD, given that diabetes is a chronic disease that needs continuing medical care.²⁴ In addition, nurses, pharmacists, and other HCPs should also be trained in order to improve the current practice of injection technique, particularly on the use of needle.^{5,8,25} Based on preliminary survey of six endocrinologists in their daily practice, nurses are the primary educators for initiation and injection techniques to the patients, followed by physicians and other HCPs, with percentages of 66.7%, 16.7%, and 16.7%, respectively. Despite being the main educator for injection techniques, a study in Nepal found that nurses had insufficient knowledge and practices regarding insulin therapy, insulin storage and preparation, injection techniques, and needle reuse. Their median insulin injection practice score was 11 out of 16, where the highest possible score in the study was 16 and each correct practice was scored “1” while incorrect practice was scored “0”. Also, 86.6% nurses in the study use single needle more than once.²⁵ These inadequacies can lead to errors in insulin administration and adverse outcomes. Therefore, CME for nurses and other medical professionals is needed to improve the knowledge, attitude, and behavior of nurses regarding insulin and injection techniques.^{25,26} Even though the CME has been done in many hospitals, more hospitals and healthcare centers should be encouraged to conduct the CME activities.

Realizing the burden of diabetes in Indonesia, there is an urgent need for more diabetes educators in the country. All health worker resources must be optimally utilized. Collaboration among various professional organizations is required to increase education about injection techniques. Pharmacists and dieticians who are in frequent contact with PWD can also play an important role in improving the practice of PWD in injection techniques including needle reuse. Aligned with this need, recently, the Ministry of Health in Indonesia established an initiative to provide support for DM management through the “Diabetes Center” program, which involves a team of professionals providing comprehensive diabetes care, from large hospitals to hospitals in districts.²⁷

Needs on Conducting Studies About Injection Technique and Improved Needle Reuse Rate

To educate patients regarding needle reuse, it is not enough to simply state that needles should not be reused, as there is study suggesting they can be used up to five times¹⁵ and there are no specific Indonesian data. The experts also believed that pen needles should not be reused; however, reusing needle might be inevitable under some circumstances. Therefore, the experts suggested the necessity to compare the outcomes associated with varying frequencies of needle reuse and use this information as a basis for making recommendations. Moreover, cost-effective studies or research using local data may be necessary to convince Payors as well as other stakeholders to improve needle reuse rates. The experts also concurred that performing a retrospective analysis or other clinical studies is crucial. To conduct such studies, a centralized database is required. In addition, a new health economics (HE) model must be developed using the available data. Since data on injection technique or single use of needles in Indonesia and worldwide are limited, a systematic literature review (SLR) can be utilized. The next action plans should involve the development of SLRs, quality circles, and studies, in addition to making use of data from existing databases.

Conclusion

The experts from Advisory Board Meeting agreed that:

- in order to optimize the use of insulin or other injectable diabetes medications in Indonesia, it is necessary to ensure physicians to start the initiation phase as early as indicated, continue optimizing its dosage to reach targeted blood sugar based on guideline, and involve all relevant stakeholders to improve insulin distribution and patient access in every primary care facility.
- there is an educational need for HCPs, including internists and other specialists regarding the utilization of insulin or other injectable diabetes medications, injection techniques, and pen needle reuse.
- conducting simple studies about injection technique, needle reuse, comprehensive blood sugar control, and other diabetes-related factors to convince the stakeholders for improving current recommendations and access to insulin or other injectable diabetes medications.

Compliance with Ethics Guidelines

This article is based on opinions of leading experts and does not contain any studies with human participants or animals performed by any of the authors.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, giving insight/feedback and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

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