REDUCING THE PERCENTAGE OF PRESCRIBING ERROR FOR IRON DEXTRAN PRESCRIPTION IN OBSTETRICS AND GYNAECOLOGY (O&G) DEPARTMENT, HOSPITAL TENGKU AMPUAN RAHIMAH (HTAR), KLANG

Parimala Vijai Indrian[1], Low Shin Yee[1], P'ng Xiu Wen[1], Tan Huay Synn[1], Muna Atirah Ramli[2], Navamani Nedincheliyin[3]

[1] Pharmacy Department, Hospital Tengku Ampuan Rahimah, Selangor State Health Department, Ministry of Health Malaysia

[2] Obstetrics and Gynaecology Department, Hospital Tengku Ampuan Rahimah, Selangor State Health Department, Ministry of Health Malaysia

[3] Nursing Unit, Obstetrics and Gynaecology Ward, Hospital Tengku Ampuan Rahimah, Selangor State Health Department, Ministry of Health Malaysia

Corresponding Author: Parimala Vijai Indrian
Email: parimalamaniraja@gmail.com

Abstract

Prescribing errors can compromise patient safety and increase healthcare costs due to inappropriate indications. A verification study in the Obstetrics & Gynaecology (O&G) wards of Hospital Tengku Ampuan Rahimah (HTAR) in 2019 found that 46.7% of iron dextran prescriptions contained errors. The standard was 0% prescribing errors in iron dextran prescriptions. This quality improvement study involved all iron dextran prescriptions from the O&G wards. The verification study was conducted from August to December 2019, followed by cycle 1 (January - May 2020), cycle 2 (June - November 2020), and cycle 3 (January - April 2023). Data was collected via knowledge assessment questionnaires and iron dextran prescription analysis. Results showed that 48.6% was contributed by wrong dose, followed by 37.1% of incomplete prescriptions, 12.9% of wrong indication and 1.4% of wrong route. An iron dextran calculation worksheet with a QR code-linked user guide was introduced to quantify patients' iron dextran requirement as part of cycle 1. A customary stamp was implemented at cycle 2 to standardise the iron dextran prescription. Cycle 3 was carried out with the introduction of the *SteProCos* Reminder Card to reinforce the process of prescribing, with the incorporation of a dosing table to recheck the calculated dose. Errors in iron dextran prescriptions decreased from 46.7% to 15.3% after the first cycle, further declining to 9.7% after the second cycle and 5.3% following the third. Prescribers' knowledge regarding iron dextran increased from 62% to 94%. The implementation of these strategies resulted in hospital cost savings, with a total of MYR1956 saved annually on medication costs during the study period. The strategies were subsequently replicated by one of the cluster hospitals. The iron dextran calculation worksheet will be converted into a user-friendly electronic version, and internal audits along with continuous education sessions will be conducted at regular intervals.

KEYWORDS: Iron dextran, Prescribing error, Dose calculation, Quality improvement study

Problem

Intravenous (IV) Iron Dextran is primarily used in inpatient O&G wards to treat adult women with moderate to severe iron deficiency anaemia and is administered as a total daily infusion (TDI) dose. It is frequently given to antenatal patients who cannot tolerate or do not respond to oral iron, as well as those with significant blood loss or chronic anaemia due to obstetric or gynaecological conditions. The benefit of using intravenous (IV) iron is that it is generally well tolerated and, most importantly, more effective, with a mean increase in haemoglobin (Hb) of approximately 0.8 g/dl compared to 0.3 g/dl with oral iron (1). Although iron dextran is approved for intramuscular injection, the total dose infusion method is preferred because it allows for a shorter hospital stay with a single dose, thus improving patient compliance. It also causes less pain and tissue damage, as intramuscular iron dextran can lead to muscle fibrosis and abscess formation (2). It is not commonly used in primary care due to the need for monitoring during infusion and the risk of adverse reactions such as pain, swelling, discolouration at the injection site, flushing, fever, chills, headache, muscle pain, and delayed systemic responses (3). The total dose needed must be precisely calculated based on the patient's pre-pregnancy weight and in accordance with specific indications, as dosing parameters vary depending on the condition being treated.

The prescription process for IV iron dextran is complex and error-prone. It requires accurate weight-based dose calculation that takes into account the patient's haemoglobin level and iron deficit. Multiple steps are involved, including selecting the correct indication, performing the correct total dose infusion (TDI) calculation, and documenting the route and infusion details clearly. Inappropriate calculation of the iron dextran dose may compromise patient safety by increasing the risk of prescribing suboptimal or excessive amounts, which can lead to acute iron toxicity, metabolic acidosis, and hemosiderosis (4,5). Patients receiving a total dose of iron dextran should be routinely monitored for anaphylaxis and hypersensitivity reactions, typically after the administration of a 25 mg test dose (6).

HTAR is a tertiary hospital which comprises various speciality services, including *Kompleks Rawatan Ibu dan Bayi* (KRIBA), providing services for O&G treatment. There are five O&G wards for adult female patients, currently using a manual system for patient data entry, covering the entire process from medication prescribing to dispensing in the pharmacy. These patients are under the care of a multidisciplinary team that consists of doctors, pharmacists and nurses. The average number of patients admitted to O&G wards is approximately 20,000 per year. About 1.3% of these patients require the administration of a total dose of iron dextran to replenish iron loss.

A study carried out in our O&G wards from February to July 2019 found that 46.7% of 188 iron dextran prescriptions contained prescribing errors. Therefore, the primary aim of this study was to reduce the percentage of prescribing errors for iron dextran prescriptions in the O&G department from 46.7% to 0% within six months of the intervention period. This initiative has a direct impact on patient care by enhancing medication safety and can be readily measured through the accuracy of iron dextran prescriptions issued in the ward.

Background

Iron dextran is a medicinal product containing a combination of iron and dextran (7). Iron dextran is the drug of choice for the treatment of iron deficiency anaemia (IDA) in women or pregnant women who are not responding to oral iron therapy (8). The total dose infusion can be completed within a relatively short duration of about 4-6 hours, resulting in reduced bed occupancy (9). The formula for calculating the parenteral iron dextran dose for blood loss is as follows (10):

$$\text{Total dose (mg Fe)} = \left((\text{Target Hb} - \text{Actual Hb}) \times \text{Body weight (kg)} \times 0.24 \right) + \text{mg iron for iron stores}$$

* Haemoglobin (Hb) in g/dL

Data such as patient's body weight and actual haemoglobin are essential for the calculation of the total iron dextran dose required by the patient. Furthermore,

unnecessary therapy with iron dextran may lead to excessive iron storage, resulting in exogenous hemosiderosis. A test dose of iron dextran was given to the patient before administering the remaining dose to the patient due to anaphylactoid reactions. Patients were also monitored for anaphylaxis and hypersensitivity reactions. Some of the factors, such as a previous adverse reaction to iron or other drugs, a fast iron infusion rate, and a history of severe atopy and systemic macrocytosis, appear to increase both the incidence and severity of hypersensitivity reactions (11). The adverse event rate following the administration of iron dextran is up to 28% (12). A study done in Malaysia reported that adverse events occurred in five patients given iron dextran, indicating a higher risk associated with pregnant women.

Globally, medication errors, particularly in the preparation and administration of parenteral medications, are prevalent. A study highlighted that errors during these stages are common in intensive care units, with incorrect drug preparation and administration rates identified as significant areas of concern (13). Although this study does not focus exclusively on iron dextran, it highlights the global potential for errors in intravenous therapies. In Malaysia, comprehensive data specifically addressing prescribing errors related to iron dextran remains limited. However, a retrospective analysis of medication errors at a tertiary hospital in northern state of Malaysia revealed that the prescribing stage accounted for 97.4% of all medication errors, with incorrect dosages contributing to more than half of these cases(14). While study encompassed a range of medications, its findings indicate a significant prevalence of prescribing errors within the Malaysian healthcare system, suggesting that iron dextran could be similarly susceptible.

Prescribing error is defined as an error that occurs when there is an unintentional, significant reduction in the probability of treatment being timely and effective due to the process of medication prescribing (15). Types of prescribing errors include incorrect drug selection (based on indications, contraindications, known allergies, existing drug therapy, and other factors), dose, dosage form, quantity, route, concentration, rate of administration, or instructions for use of a drug product ordered or authorized by physician (or other legitimate prescriber); illegible prescriptions or medication orders that lead to errors that reach the patient (15,16). Statistics from the Ministry of Health showed that the total number of reported medication errors increased from 2818 to 3046 in 2019, and prescribing errors showed the highest proportion of cases (51%) (17).

Factors contributing to prescribing errors include knowledge and experience gaps, workload, complex dosing regimens, special populations, lack of guidelines, and inadequate decision support (18). Reducing the percentage of prescribing errors for iron dextran is crucial to ensure patient safety and optimal therapy outcomes. Several strategies have been employed in other settings to achieve this goal, such as implementing electronic prescribing systems that have built-in checks and alerts to flag potential errors or contraindications (19). Providing education and training for healthcare professionals on the proper prescribing and administration of iron dextran, including dosage calculations and monitoring parameters, has also been implemented in many other countries (20). Standardising medication practices is another strategy to reduce prescribing errors (21). Developing and adhering to standardised protocols for prescribing, preparation, dispensing, and administration, including using standard medication concentrations and avoiding dangerous abbreviations, will help to reduce variability and errors (21).

Measurement

This quality improvement study was conducted over three cycles from January 2020 to April 2023 by pharmacists, medical officers, and nurses in the O&G wards. Data were collected using the universal sampling method from all O&G wards. The study indicator was the percentage of prescribing errors of iron dextran, calculated using the formula below:

$$\textit{Percentage of prescribing error of iron dextran} = \frac{\textit{Number of iron dextran prescriptions with prescribing errors}}{\textit{Total number of iron dextran prescription}} \times 100$$

The standard for this study was set at 0% prescribing errors in iron dextran prescriptions according to the Malaysian Patient Safety Goals (22). The inclusion criteria were all iron dextran prescriptions from O&G wards. An Iron Dextran prescription analysis checklist was used to identify both the prescribing errors due to incomplete documentation, such as inadequate patient clinical information and inadequate patient clinical data, and prescribing errors due to wrong dose, wrong indication, and wrong administration. Any prescription identified with one or more prescribing errors was included in the number of iron dextran prescriptions with prescribing errors, which is the numerator of the indicator in the calculation. The prescription analysis checklist would thoroughly allow for identifying the types of prescribing errors, and separating each error type could help to target specific interventions. The data were collected during the screening of prescriptions in the wards with ward pharmacists and at the inpatient pharmacy before supplying iron dextran, both during and after office hours. The verification study was conducted from August to December 2019, followed by cycle 1 from January to May 2020, cycle 2 from Jun to November 2020, and cycle 3 from January to April 2023. The study was withheld for two years (2021 – 2022) due to the change of the O&G wards to COVID wards and medical wards. Thus, the improvement for further remedial actions could not be enforced.

Initial Assessment of the Problem

Prescribing errors with iron dextran, an intravenous iron preparation, can lead to serious consequences. These errors include incorrect dosing, inappropriate patient selection, or failure to recognise contraindications and precautions. An in-depth review of IV iron dextran prescriptions was conducted using a structured Prescription Analysis Checklist to identify and categorise errors. This checklist enabled the systematic detection of specific types of prescribing errors, including incorrect dosing, incomplete documentation, inappropriate indications, and incorrect routes of administration.

The data revealed that the most common error type was incorrect dosing, which accounted for 48.6% of all prescribing errors. This was followed by incomplete prescriptions (37.1%), wrong indication (12.9%), and wrong route (1.4%). By categorising errors in this manner, it became evident that targeted interventions could be more effectively designed to address the most prevalent and critical errors.

This structured error identification process provided the foundation for a tailored quality improvement approach, ensuring that interventions such as calculation aids, standardised stamps, and visual reminders addressed the specific shortcomings in current prescribing practices. The verification study revealed that no documentation of dose calculations was found in the patients' clinical records, although the prescribed doses were written on the prescriptions. A total of 10.6% of patients did not receive a test dose and subsequently developed adverse reactions such as rigours, shortness of breath, palpitations, and blurred vision after administration of the full dose. Data on adverse drug reactions were obtained from reports of iron dextran administrations. In addition, 4.6% of prescriptions were found to contain incorrect body weight entries for pregnant patients, resulting in higher prescribed doses and adverse effects such as shortness of breath and dizziness.

A validated knowledge assessment questionnaire was used to identify the main contributing factors, involving a total of 245 participants comprising all doctors and nurses in the O&G Department throughout the study period. The questionnaire consisted of eight questions assessing knowledge of iron dextran, with each correct answer scored as one point. A total score greater than four indicated good knowledge of iron dextran, while a score between 1 and 4 reflected poor knowledge. Along with this questionnaire, the respondents were required to complete a short survey on the availability of administration instructions and reference materials to analyse the issue of inadequate or unavailable references. Knowledge assessment showed that 65% of doctors and nurses scored between 1 and 4, representing poor knowledge regarding iron dextran. All respondents

(100%) also mentioned the unavailability of administration instructions and references in the ward. Figure 1 illustrates the possible contributing factors identified during the initial assessment of the problem. Three main factors were identified that could change the prescribing pattern of iron dextran in our local healthcare setting: inadequate knowledge among doctors and nurses, lack of administration instructions, and unavailable references in the ward.

During the pre-remedial phase, prescription of iron dextran used general medication prescription slips, where minimal emphasis was given for additional information, such as the patient's body weight, dose calculation, and other clinical data required for iron dextran prescription. The current process of care for doctors prescribing iron dextran in the ward was reviewed (Figure 2) to identify the critical steps involved in the prescribing process. The figure illustrates the sequence of activities, starting from identifying patients who require iron dextran to the prescribing and subsequent administration of the medication in the ward. The Model of Good Care (MOGC), as shown in Table 1, explains the steps taken at each factor in the critical steps highlighted in Figure 2. The iron dextran prescription analysis checklist was used to evaluate the criteria standard for each critical step in MOGC.

Strategy

Various remedial measures were implemented during the intervention phase from January 2020 to April 2023 to reduce iron dextran prescribing errors to 0% according to the standard. An iron dextran worksheet with a QR code-linked user guide was introduced to quantify patients' iron dextran requirement as part of cycle 1. Cycle 1 targeted the factor of inadequate patient clinical data and administration instructions. The doctor in the ward filled the Iron Dextran Calculation Worksheet with a QR code-linked user guide, and the pharmacist would countercheck the iron dextran prescription and calculation worksheet before supplying the medication accordingly. This worksheet was attached to the patient's record in the ward as proof of documentation.

Nurses in the ward, who would administer iron dextran to patients, needed to monitor for adverse drug reactions after the test dose was given and sign the worksheet before the remaining dose was administered. Additionally, knowledge empowerment and adherence to the correct prescribing of iron dextran were achieved through the provision of continuous education to the healthcare staff in O&G and pharmacists regarding iron dextran. Pharmacist-led continuous education sessions in the ward provided the staff with regular updates and knowledge on iron dextran prescribing. The nurses were also educated on monitoring tolerability, including the risk factors, signs and symptoms and potential complications of iron toxicity resulting from inappropriate iron dextran prescribing. They were further encouraged to consult pharmacists for any inquiries related to iron dextran prescriptions.

Upon re-evaluation of the MOGC (Table 1), several process steps that did not meet the established standards were reviewed, including the prescribed dose regimen, the remaining dose and the administration instruction prescribed. A customary stamp comprising the template of iron dextran dose and dilution prescribing was introduced in cycle 2 to replace manually written prescriptions, and this strategy demonstrated substantial improvements in prescribing iron dextran. A customary stamp was implemented in cycle 2 to standardise the prescribing of iron dextran (Appendix 1). The doctors should stamp on the prescription and fill in the calculated dose manually. The purpose of the iron dextran prescribing stamp was particularly to improve the prescribing, where the test dose and the remaining dose should be prescribed correctly, together with administration instructions on the prescription. Notification memos of every critical step change were circulated to the management of the hospital, the head of the Patient Safety Goals program and the O&G Department to create awareness and for the sustainability of the new interventions.

The next strategy was introduced to enhance the accuracy and consistency of iron dextran prescribing. In cycle 3, a summary of the prescribing iron dextran process was introduced in a small card form containing information on collecting the patient's details, calculating the body mass index (BMI) to decide on ideal body weight or actual body weight for dose calculation,

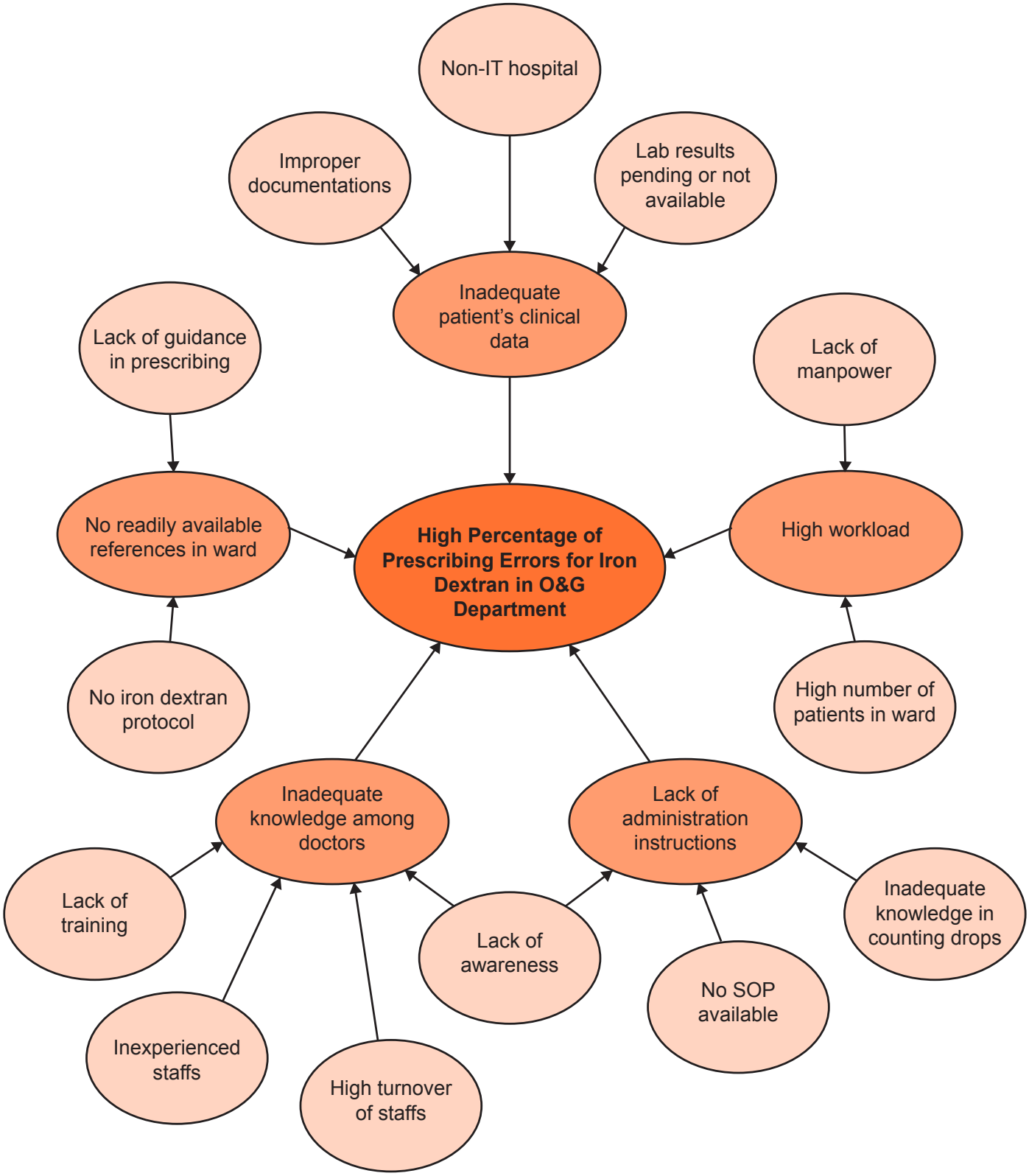


Figure 1: Problem analysis chart for the high percentage of prescribing errors for iron dextran prescriptions.

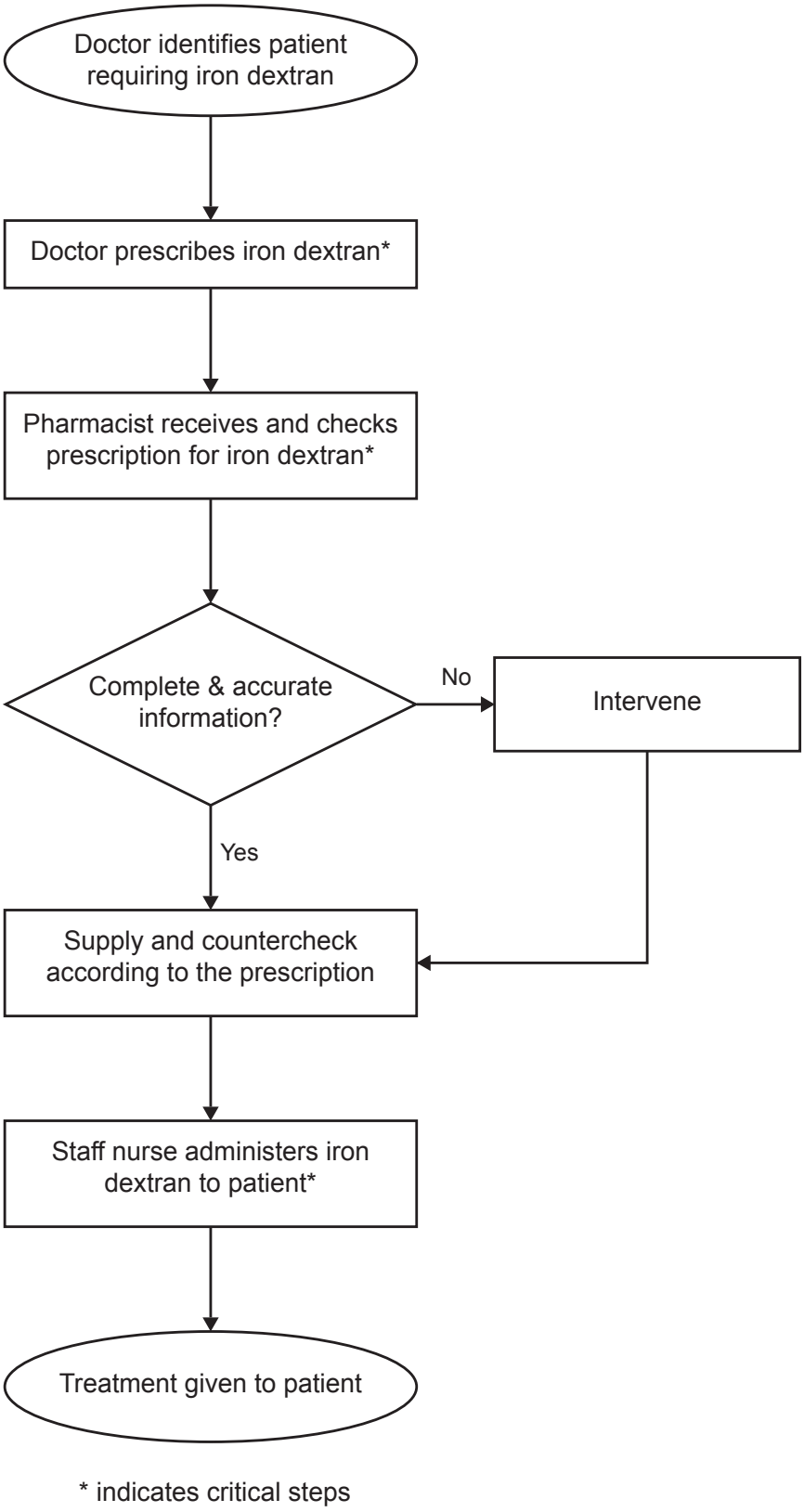


Figure 2: Current process of care for prescribing iron dextran in the ward

Table 1: MOGC for prescribing iron dextran in the O&G ward

No	Critical Step	Criteria	Standard	Achievements			
				Verification Study	Cycle 1	Cycle 2	Cycle 3
1	Doctor prescribes iron dextran	Adequate patient's clinical data available	100%	37.3%	100%	100%	100%
		Dose regimen prescribed for test dose	100%	60.7%	94.9%	100%	100%
		Dose regimen prescribed for the remaining dose	100%	60.7%	94.9%	100%	100%
		Administration instruction prescribed	100%	52.9%	93.2%	100%	100%
		Test dose and remaining dose prescribed with iron dextran stamp	100%	0%	0%	94.8%	96.5%
2	Pharmacist receives and checks the prescription for Iron Dextran	Required information in the worksheet is completely filled.	100%	0%	100%	100%	100%
		Total iron requirement calculated	100%	0%	91.1%	95%	97%
		Requirement rounded to the nearest 100mg	100%	20.3%	91.1%	94.2%	100%
		Calculation is counter-checked by a pharmacist	100%	0%	100%	100%	100%
3	Staff nurse administers iron dextran to the patient	Test dose of iron dextran is administered	100%	60.7%	99.3%	100%	100%
		Monitored and signed for patient's tolerability	100%	0%	100%	100%	100%
		Remaining dose administered accordingly	100%	60.7%	99.3%	100%	100%

calculating the total dose requirement and filling in the worksheet accordingly. The card serves as a quick reference tool to support adherence to protocol and streamline the prescribing process. The calculated dose could be verified by Ganzoni printed on the back of the card (23). This card, named the SteProCos Reminder Card (Appendix 2), was developed to minimise contributing factors to prescribing errors for iron dextran prescriptions, particularly those related to the test dose, remaining dose, and total iron requirement calculations. A survey was conducted to evaluate staff satisfaction, usability of the iron dextran calculation worksheet, knowledge of prescribing and administration of iron dextran and the impact of the reminder card.

Results

Post-intervention evaluations were conducted after each cycle. The percentage of prescribing errors for iron dextran prescriptions reduced from 46.7% to 15.3% after cycle 1 (Figure 3). In addition, completion of the iron dextran worksheet by prescribing doctors improved, with adequate documentation of patients' clinical data increasing from 37.3% to 100%. The completion and accuracy of essential information in the worksheet, including patient identity, appropriate body weight, target haemoglobin, actual haemoglobin, and clinical indication, improved significantly from 0% to 100%. This data would be required for the pharmacist to check before supplying the correct medication to the ward, especially in situations where the pharmacist is not available in the O&G wards or during after-office hour service. The administration of the test dose and the remaining dose was improved from 60.7% to 99.3% as it was compulsory to prescribe the test dose and its infusion time on the prescription as per the worksheet. All patients on iron dextran were compulsorily monitored and signed for patient tolerability by the nurses administering the iron dextran total dose infusion (0% pre-intervention to 100%).

The remedial action of continuous education for doctors, nurses, and pharmacists showed improvement in the healthcare personnel's knowledge assessment. The continuous education program increased the proportion of staff with good knowledge levels from 62% to 84% with a total of 154 personnel. Prescribing error was further reduced from 15.3% to 9.7% after cycle 2. Iron dextran prescriptions that were complemented with prescribing stamps used to record the test dose, prescribed dose according to the worksheet, and administration instructions achieved a compliance rate of 94.4%. Cycle 2 also improved the errors of administration by the nurses, where 100% of the iron dextran was diluted and administered according to the correct prescription.

Results from cycle 3 showed further reduction of iron dextran prescribing errors from 9.7% to 5.3%. Prescribing iron dextran with the iron dextran worksheet and administration instruction for iron dextran prescription remained 100% in cycle 3. This cycle showed slight improvement, with increased use of the test dose and remaining dose stamps, although they were not fully utilised. The prescribing step reminder card proved effective in prompting prescribers to stamp the prescription after completing the worksheet, improving compliance from 94.8% to 96.5%. Survey post-cycle 3 showed improvement in knowledge of prescribing iron dextran from 84% to 94%. A survey evaluating staff's satisfaction and the usability of the worksheet showed 95% satisfaction with 100% usability of the worksheet.

Pharmacists were able to perform 100% counterchecking of the information documented in the worksheet. Additionally, nurses consistently monitored and documented patient tolerability, with 100% of administrations properly signed and verified. Without a specific intervention that mandated test dose prescribing previously, nurses would proceed to administer the full iron dextran dose as written in the prescription, potentially bypassing the test dose. The monitoring of adverse drug reactions during test dose administration has been associated with reduced clinical costs and shorter hospital stays related to iron dextran administration. In our study, specific data on the reduction of clinical costs and hospital stay duration were not available, and further data collection is required to quantify the impact of this intervention.

The reduced incidence of inappropriate indications also led to decreased wastage of iron dextran ampoules. Each prescription required the indication to be documented in the iron dextran worksheet. This improvement contributed to reducing the overestimation of iron dextran dosage, which commonly occurred in cases of acute blood loss. When iron dextran is prescribed specifically for acute blood loss replacement, the dosage calculation should focus solely on correcting the immediate haemoglobin deficit, without accounting for the replenishment of long-term iron reserves. Ensuring the appropriateness of the indication during the prescribing process is crucial for accurate dose calculation and to prevent overestimation.

Iron stores replenishment is more relevant in chronic iron deficiency anaemia, where ongoing iron loss or inadequate intake over time has depleted the body's reserves. In contrast, for blood loss scenarios (such as postpartum haemorrhage or surgical blood loss), the iron requirement is calculated based on the estimated volume of blood lost and the haemoglobin concentration desired, with no additional allowance made for restoring storage iron (typically 500 mg in standard calculations). This approach avoids overestimating the dose, which can reduce the risk of iron overload and related adverse effects. This resulted in cost savings for the hospital, with a total of MYR 1,956 per year saved on medication costs during the study period.

Overall, the achievable benefit not achieved (ABNA) was successfully reduced from 15.3% cycle 1 to 5.3% after cycle 3 (Figure 3). All the critical aspects, which were subpar before the interventions were done, showed improvements following the implementation of the strategies. Nonetheless, there is still room for improvement as we have yet to achieve the standard of 0% prescribing errors.

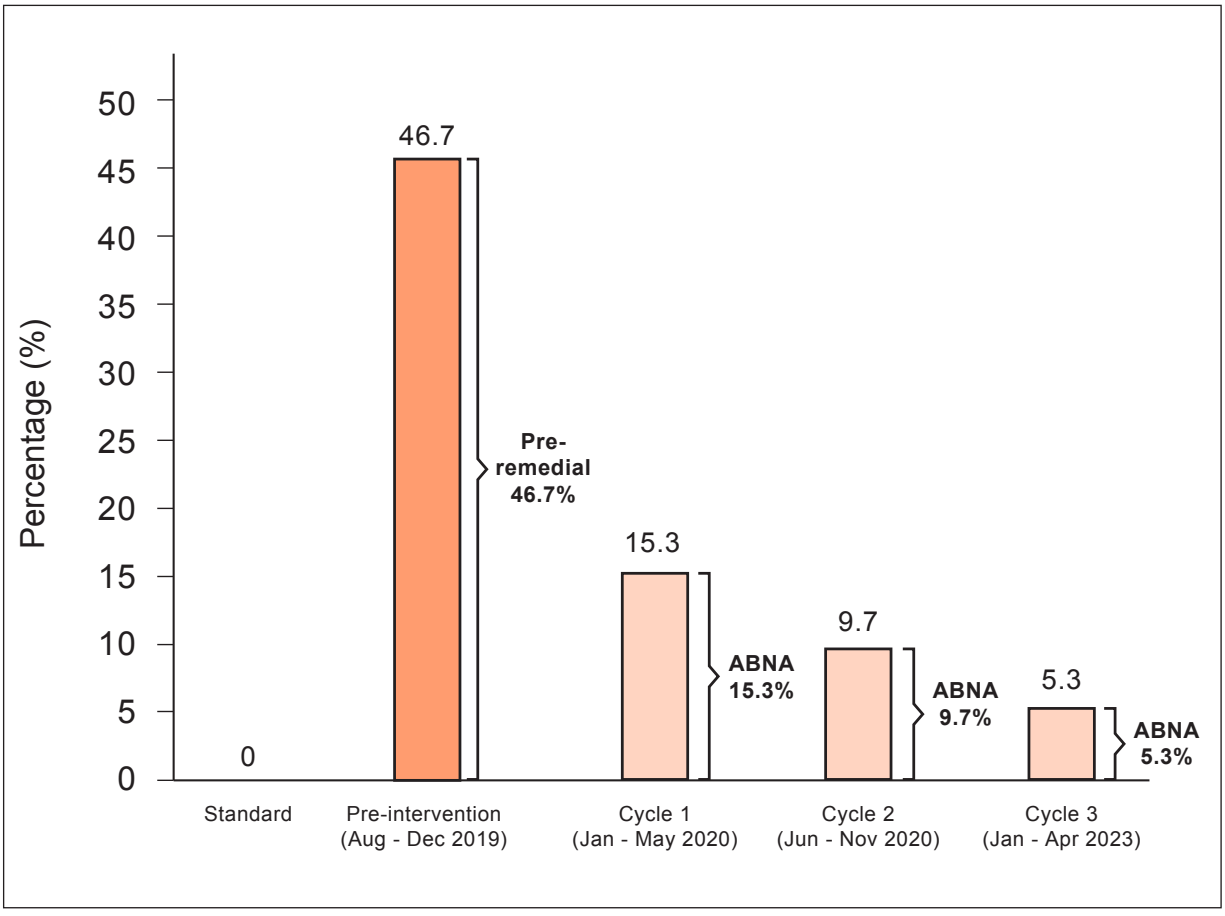


Figure 3: Achievement of the percentage of prescribing errors of iron dextran pre- and post-intervention cycles

Lessons and Limitations

This study looked into more specific aspects of prescribing iron dextran among O&G patients in hospital settings using manual systems. The collaboration between healthcare personnel is greatly needed to achieve better patient care. The iron dextran calculation worksheet and *SteProCos* Reminder Card also appear feasible and replicable to other department wards in HTAR or other hospitals, as it can be easily reproduced at minimal cost. Through this study, this approach has been proven to be beneficial in reducing prescribing errors for iron dextran prescriptions. Pharmacists, working together with other healthcare professionals, play an important role in ensuring the optimum dose and calculation of iron requirement. The survey evaluating staff satisfaction, usability of the iron dextran calculation worksheet stamp and reminder card, as well as knowledge related to the prescribing and administration of iron dextran, showed that most staff were highly satisfied with the use of the worksheet.

Although monitoring and proper administration of the test dose can be challenging in a busy tertiary hospital due to high patient turnover and limited staffing, this project successfully addressed the issue. The introduction of the iron dextran calculation worksheet, which included clear nursing accountability for administering the test dose and monitoring for adverse reactions, led to 100% compliance. This achievement underscores the project's strength in ensuring patient safety and standardising best practices for IV iron dextran administration. The importance of continuous awareness and education activities may enhance these steps.

Despite the success in reducing the prescribing errors for iron dextran, this study has several limitations and challenges. One of the limitations identified was the availability of multiple online calculators for estimating iron dextran dosage. This contributed to the lack of a standardised, universally accepted dosage calculation method, which in turn complicated the prescribing process and led to variability in prescriptions. While these tools may appear convenient, they can lead to errors if used without accurately inputting critical clinical parameters such as actual body weight, pre-pregnancy weight, trimester of pregnancy, and the appropriate clinical indication. Besides that, documentation and calculation may be missed and inaccurate when using online calculators to calculate the total dose required for iron dextran based on the indication, as the formula will be different for different indications.

This study did not involve other disciplines in HTAR, as they might not be using iron dextran total dose infusion. Other wards in this hospital might also have other choices of iron preparations to be administered. It will be an added value if future studies explore the usage and prescribing of other iron parenteral preparations in other wards.

Although a more favourable outcome, specifically a 0% prescribing error rate was anticipated, unexpected human factors may have influenced the effectiveness of the strategy. For example, the revised prescribing process for iron dextran required additional time and effort, including completing the worksheet, using the prescribing stamp, and monitoring patient tolerability. These added steps may have affected adherence, particularly during periods of high workload. Nevertheless, integrating the worksheet into the standard work process is expected to promote routine and consistent practice over time.

Conclusion and the Next Steps

This quality improvement study has determined the magnitude of prescribing errors of iron dextran in O&G wards of HTAR and identified the main contributing factors. This study successfully reduced the total percentage of prescribing errors for iron dextran from 46.7% to 5.3%, and identified key contributing factors, through the formulation and implementation of targeted strategies in the O&G wards. It also resulted in a reduction of adverse drug reactions and medication wastage costs associated with iron dextran. The implemented strategies incurred minimal cost and are sustainable for future practice through the incorporation of the revised forms into the Malaysian Standard: International Organisation of Standardisation (MS ISO) quality procedures of HTAR. This study has been replicated by the O&G departments of Hospital Banting,

which is one of the non-lead hospitals in the HTAR's cluster (Appendix 3).

An additional innovative strategy currently in progress involves digitalising the iron dextran calculation worksheet, enabling pharmacists to verify doses electronically and reducing paper waste. This project is scheduled for implementation across all wards in HTAR. Periodic internal audits and knowledge assessments will be conducted, supported by continuous education sessions at regular intervals. In the future, these remedial actions may be extended to other hospitals with manual prescribing systems, to improve overall clinical outcomes and enhance the safety of iron dextran prescribing.

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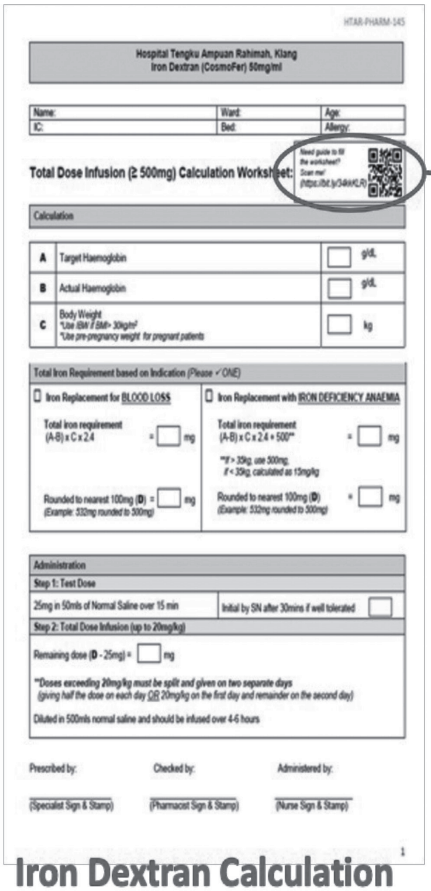
Conflict of Interest

The authors declare that there was no conflict of interest.

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Appendix 1: Iron Dextran Calculation Worksheet



Hospital Tengku Ampuan Rahimah, Klang
Iron Dextran (CosmoFer) 50mg/ml

Name: | Ward: | Age:
IC: | Bed: | Allergy:

Total Dose Infusion (≥ 500mg) Calculation Worksheet:

Need guide to fill the worksheet? Scan me! (https://bit.ly/34kKLR)

Calculation

A	Target Haemoglobin	g/dL
B	Actual Haemoglobin	g/dL
C	Body Weight *Use IBW if BMI> 30kg/m² *Use pre-pregnancy weight for pregnant patients	kg

Total Iron Requirement based on Indication (Please ✓ ONE)

☐ Iron Replacement for BLOOD LOSS

Total iron requirement (A-B) x C x 2.4 = mg

Rounded to nearest 100mg (D) = mg
(Example: 532mg rounded to 500mg)

☐ Iron Replacement with IRON DEFICIENCY ANAEMIA

Total iron requirement (A-B) x C x 2.4 + 500** = mg

**If > 35kg, use 500mg,
If < 35kg, calculated as 15mg/kg

Rounded to nearest 100mg (D) = mg
(Example: 532mg rounded to 500mg)

Administration

Step 1: Test Dose

25mg in 50mls of Normal Saline over 15 min | Initial by SN after 30mins if well tolerated ☐

Step 2: Total Dose Infusion (up to 20mg/kg)

Remaining dose (D - 25mg) = mg

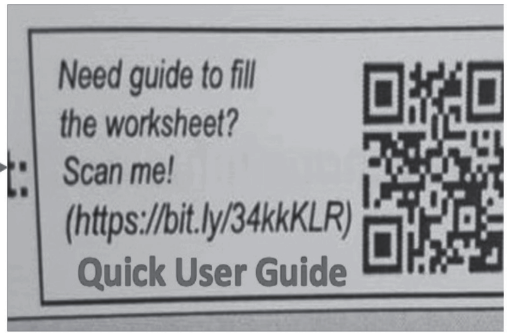
**Doses exceeding 20mg/kg must be split and given on two separate days (giving half the dose on each day OR 20mg/kg on the first day and remainder on the second day)

Diluted in 500mls normal saline and should be infused over 4-6 hours

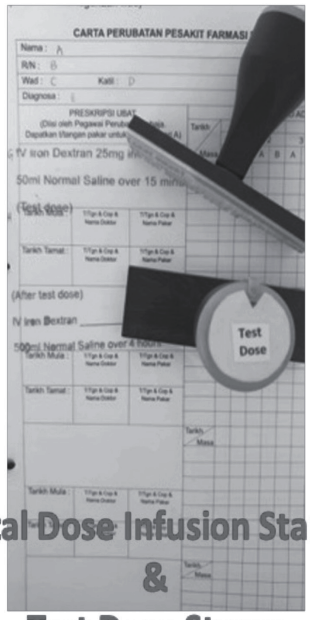
Prescribed by: (Specialist Sign & Stamp)
Checked by: (Pharmacist Sign & Stamp)
Administered by: (Nurse Sign & Stamp)

1

Iron Dextran Calculation Worksheet



Remedial Tools

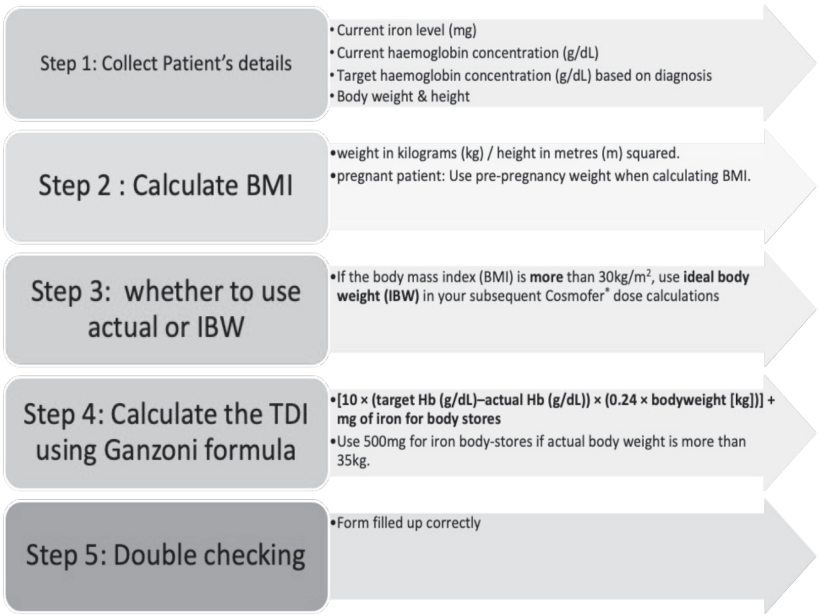


Total Dose Infusion Stamp & Test Dose Stamp

Appendix 2: Stepped process of Cosmofer (*SteProCos*) Reminder Card

STEPROCOS

Stepped Process for Cosmofer Reminder Card



Safe and Rapid correction of Hb in Pregnant women with Total Dose Infusion of COSMOFER

	Increase in Hb required (g/dL) = Target Hb minus Actual Hb						
Body wt (kg)	1g/dL	2g/dL	3g/dL	4g/dL	5g/dL	6g/dL	7g/dL
40kg	6	7	8	9	10	11	12
45kg	6	7	8	9	10	11	12
50kg	6	7	9	10	11	12	13
55kg	6	8	9	10	12	13	14
60kg	6	8	9	11	12	14	15
65kg	7	8	10	11	13	14	16
70kg	7	8	10	12	13	15	17
75kg	7	9	10	12	14	16	18
80kg	7	9	11	13	15	17	18
85kg	7	9	11	13	15	17	19
90kg	7	9	11	14	16	18	20

Appendix 3: Replication of project with Hospital Banting

HOSPITAL BANTING
Jalan Sultan Alam Shah
42700 Banting
Selangor Darul Ehsan
Malaysia

Tel : 603-3187 1333
Faks : 603-3181 8834
E-mel : hospitalbanting@moh.gov.my
Laman Web: http://hbanting.moh.gov.my

Ruj : HBTG.740/03 Jld. 9 (22)

Puan Aziah binti Abdullah
Ketua Jabatan Farmasi
Hospital Tengku Ampuan Rahimah, Klang

4 Mac 2021

Puan,

Cadangan Replikasi Projek "*Reducing the Percentage of Prescribing Errors for Iron Dextran in Obstetrics and Gynaecology (O&G) Department*, HTAR Klang" di Hospital Banting

Dengan hormatnya, perkara di atas adalah dirujuk.

2. Merujuk kepada edaran senarai pemenang Karnival Inovasi 2020 Jabatan Kesihatan Negeri Selangor, projek disebutkan di atas adalah johan bagi kategori Clinical Audit dan adalah pasukan di bawah jabatan puan.

3. Jabatan Farmasi bersama Jabatan Obstetrik dan Ginekologi Hospital Banting bercadang untuk menjalankan replikasi projek ini di fasiliti kami. Buat masa ini, fasiliti kami tidak mempunyai format khusus untuk pemberian *Iron Dextran*. Kami berharap dengan usaha replikasi ini, kesilapan pengubatan berkaitan *Iron Dextran* di fasiliti kami dapat dikurangkan dan penjagaan pesakit dapat dItambahbaik. Kami mengharapkan kerjasama baik daripada pihak puan dan jabatan bagi cadangan replikasi projek ini.

4. Pihak kami boleh dihubungi oleh puan atau wakil pihak puan melalui Puan Siti Nurfairuz binti Mohd Fathir, Pegawai Farmasi yang bertugas di Wad O&G di talian 03-3187133 (samb. 356) , 012-3940821 atau email nurfairuz@moh.gov.my

Sekian, terima kasih

"PRIHATIN RAKYAT : DARURAT MEMERANGI COVID-19"
"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah

DR. MALAR KANDASAMY
NO. PENDAFTARAN PENUH MPM: 33260
PAKAR PERUBATAN O&G GRED KHAS C
HOSPITAL BANTING

(DR MALAR KANDASAMY)
Ketua Jabatan O&G,
Hospital Banting
s.k Pn Norima bt Md Noor
Ketua Jabatan Farmasi
Hospital Banting

PENYAYANG, PROFESIONALISME DAN KERJA BERPASUKAN ADALAH BUDAYA KERJA KITA
(sila catatkan rujukan surat ini apabila berhubung)

Hospital Rakan Bayi

CERTIFIED TO ISO 9001:2015