Review Article

Choice of insulin preparation in indoor patients

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The choice of appropriate insulin regimes is of paramount importance while planning glycemic management of in-patients. Equally important, however, is the correct choice of insulin preparation and delivery devices.

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The use of insulin for glucose control in hospital settings is well established. While intravenous insulin is the regime of choice in critically ill patients, subcutaneous insulin is advised in non-critically ill person, or upon transition to non-ICU (intensive care unit) setting[1,2].

A multitude of original and bio similar insulin preparations, including human insulin and analogues, are now available, in varying concentrations of 40,100, 300 and 500 IU/ml. There are non-injectable insulin therapies (glucagon-like peptide 1 receptor agonist (GLP1RA) in the market as well. This creates confusion and room for error in the in hospital care setting, where anesthesiologists, intensivists and other health care professionals deal with a multitude of drugs.

A systematic taxonomy study is necessary to understand the various insulins available[3]. Insulin can be studied as regimes, preparations and as delivery devices. Preparations include a number of insulins and insulin analogues, which are available as a multitude of trade names. Inter-disciplinary guidelines are available to help plan glycemic management in patients admitted in hospital[1,2]. These articles focus on insulin regimes, but do not highlight issues related to choice of insulin preparations. This communication highlights the various preparations of insulin that can be used in hospital, providing the intensivist with information to help smooth and efficient diabetes care delivery.

Intravenous Insulin :

Intravenous insulin is the preferred mode of treatment in critically ill patients. Only short acting insulins can be delivered intravenously: these include regular insulin, insulin aspart, insulin lispro, and insulin glulisine[4]. While regular insulin is available in India, in both 40 IU/ml and 100 IU/ml concentrations, the rest are marketed only as 100 IU/ml preparations. All these insulins are presented in vials, cartridges and disposable pens (except lispro, which is not sold as vials)

Human regular insulin, in a concentration of 40 IU/ml, is the most preferred intravenous insulin in India. An originator insulin, which provides quality assurance and cold chain maintenance, should ideally be preferred[5,6]. In patients who have been using an analogue insulin prior to admission, or in whom it is expected that analogue insulin will be prescribed upon transition to subcutaneous regimes, the same preparation can be used intravenously. Substitution with biosimilars should be avoided[5].

Regular insulin, aspart and lispro are compatible for use with 5% dextrose, normal saline and Ringer lactate, but glulisine can be used only with 5% dextrose[4].

From an ICU perspective, it is more efficient to use only one type of rapid acting insulin, in the same concentration, with the same delivery device (syringe or pen) in all patients[7]. This make instructions easy to follow, allows use of a nurse driven protocol, and minimizes errors of commission. Compatibility with various intravenous fluids must be ensured, however. Sliding scale insulin use should be avoided in ICU settings.

Subcutaneous Insulin :

Subcutaneous insulin is used in the in- hospital setting for transition from the intensive care to the non-intensive floor. As the onset of action of subcutaneous insulin takes time, and as the half-life of intravenous insulin is in minutes, it is recommended that intravenous insulin be discontinued at least half an hour after the first dose of rapid acting insulin has been administered subcutaneously[1,2]. The first dose of basal insulin should be injected 2-3 hours prior to discontinuation of intravenous insulin.

All available rapid acting, premixed and basal insulins can be used subcutaneously. In the indoor setting, however, it is rational to use a limited number of preparations and delivery devices[7], in order to minimize errors. Insulin analogues are preferred because of the lower risk of hypoglycemia and variability associated with their use.

The choice of insulin at transition should take into account the expected regime to be prescribed at time of discharge. The ideal in- patient regime is a basal-bolus regime. While any bolus insulin can be prescribed (regular human, aspart, glulisine, lispro), it is preferable to choose

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aspart or lispro if the patient is planned to be sent home on biphasic aspart (BIAsp), biphasic Lispro(Lis Mix) or insulin degludec aspart (IDeg Asp) at discharge. Basal insulins that can be used are NPH (neutral protamine Hagedorn), glargine, detemir and degludec. NPH has a high variability coefficient, and is no longer preferred. Glargine and detemir achieve steady state after 2 doses, and detemir can be administered twice daily to achieve a faster effect. Degludec has the least variability and risk of action, and achieves steady state after 3 doses[8].

The insulin regime can be de-escalated to a lesser frequency upon discharge, if the patient is well controlled and the comorbid condition has been resolved. Examples of such regimes include basal insulin, and premixed or co-formulation dual action insulins. The insulin preparations have already been listed. Thrice daily regimes such as two rapid acting doses with breakfast and lunch, and a dual action insulin with dinner, can also be used.

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