Standardising practices through form design and education improves insulin management

Fiona B McIver, Charles A Mitchell, Carmel P Finn and Maarten C Kamp

Abstract

Diabetes is common in hospitalised patients and insulin is frequently required for management. Insulin is a high-risk drug, accounting for about 15% of reported medication-related incidents. Despite its complexity, insulin management in hospitals is often undertaken by junior and non-specialist staff. Improving insulin management requires addressing safe prescribing and administration as well as quality use of insulin. Common errors in insulin use are well documented and can be addressed through form design and enhancing decision support. We undertook to improve insulin management using a locally proven improvement methodology. New forms were developed for intravenous and subcutaneous insulin and blood glucose management. Audited pilot studies in four hospitals confirmed improved insulin management without adversely impacting on overall diabetes management as assessed using Glucometrics. Subsequently, the forms have been introduced to 70% of Queensland public hospitals with roll-out to remaining hospitals continuing. Large-scale standardisation of insulin management is feasible.

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What is known about the topic?

Recent literature has seen an increased focus on inpatient diabetes management, with studies demonstrating that glycaemic control is poor. Tools and protocols that have been implemented to standardise treatment have largely been unit or hospital based.

What does this paper add?

This paper demonstrates that large scale, state-wide standardisation of prescribing tools incorporating features to aid safe prescribing can be achieved without adversely affecting blood glucose control.

What are the implications for practitioners?

Reduced training costs in a highly mobile health workforce and minimisation of unclear prescribing through the use of incorporated safety features are potential benefits of standardised prescribing forms for diabetes management. However, such tools cannot be expected to improve blood glucose control without extensive educational intervention.

INSULIN IS RECOGNISED internationally as a high-risk drug, accounting for about 15% of the highest risk actual and potential medication-related incidents.[1] Errors in insulin prescribing and administration often occur as a result of unclear documentation, as well as the need to review multiple documents.[2]

In addition to errors, the quality of insulin management is often suboptimal due to junior and non-specialist clinicians' limited knowledge of:

- the many insulin types and brands and their pharmacological properties;
- insulin dosing and blood glucose level (BGL) management; and
- the complexity of tailoring a patient's dosing regimen to their individual requirements.

This has led to inappropriate or a lack of appropriate responses to BGLs that are outside the limits set for notification of hyperglycaemia and hypoglycaemia.

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1 Examples of insulin errors

Error type and examples	Risk/s
Prescribing	
Failure to properly adjust insulin therapy[12]	Inadequate glycaemic control
Use of "u" as abbreviation for units[12]	10-fold dose administration error
Use of stand-alone subcutaneous "sliding scales"[12]	Inadequate glycaemic control, hyperglycaemic emergency
Unclear or incorrect route of administration[12]	Given by incorrect route
Inconsistent intravenous insulin prescribing[2]	Lack of standardisation in orders leading to inconsistencies in doses administered
Administration	
Administration of a wrong dose[12]	Hypoglycaemia and occasionally hyperglycaemia
Administration of the wrong insulin type[12]	Hypoglycaemia and occasionally hyperglycaemia
Omission of doses[12]	Inadequate glycaemic control
Routine insulin dose orders separated from supplemental (top-up) doses[2]	Supplemental dose omission
Wrong timing of doses[12]	Hypoglycaemia
Monitoring (blood glucose level and dose effect)	
Lack of communication among the multidisciplinary team (including notification of alerts for hypoglycaemia and hyperglycaemia)[2]	Blood glucose level pattern misinterpreted; lack of response to hyper and hypoglycaemia
Improper monitoring, timing, and assessment of blood glucose results[12]	

Standardised inpatient diabetes management has not previously been systematically addressed across a statewide hospital system. Suboptimal treatment methods, including a lack of proactive management of hyperglycaemia, are well documented.[3] There has been a recent increase in focus on inpatient management of glycaemia internationally.[4] Improved glycaemic control has recently been demonstrated by the use of "proactive" intensive insulin therapy (basal insulin in combination with premeal routine and supplemental rapid-acting insulin) in comparison with stand-alone "reactive" subcutaneous insulin "sliding scales" (using variable doses of rapid-acting insulin according to the blood glucose level at time of administration).[5]

Ausdiab 2001[6] estimated the prevalence of diabetes in the Australian adult population at 7.5%. The prevalence of diabetes in Australian tertiary hospital patients has been estimated at 23%.[7] Considering that diabetes in hospitalised patients is common and insulin is frequently prescribed, there is a need to ensure the safe and effective prescribing, administering and monitoring of medications for diabetes, particularly of insulin.

The reported incidence of actual harm occurring as a result of insulin errors is quite low. However, insulin errors have resulted in death and severe morbidity. Hellman[8] found that 33% of medication error-related deaths that occurred within 48 hours of the error were attributable to insulin. The incidence and probable causes need to be reported together with "near misses" so that solutions can be found to reducing the likelihood of harm.[9] Distinctions need to be made between safe prescribing of insulin, its safe administration and quality management of BGLs.

Our group addressed the recognised issues of suboptimal insulin prescribing and administra-

tion separately as the first step in improving overall insulin management.

Form redesign was undertaken to improve the safety of insulin prescribing and administration. This enables:

- all documentation required to prescribe and administer insulin being on one form;
- the inclusion of prompts for clinicians, and features that will reduce or eliminate the use of unsafe documentation. For example, eliminating the use of "u" as an abbreviation for "units" was expected to facilitate this. Additionally, prompts have been incorporated to encourage the use of intensive insulin regimens in place of sliding scales.

Standardisation and the resultant uniformity of practice have been shown locally to reduce prescribing and administration errors,[10] and a pilot study involving insulin administration resulted in a reduction of the frequency of hypoglycaemia.[11]

The primary aim of this medication initiative was to improve the safety of insulin prescribing and administration in Queensland public hospitals without adversely affecting blood glucose control. Common errors related to insulin that have previously been documented are listed in Box 1. This study was undertaken to measure the effect of the form redesign and system change introduced, through the use of standardised pre- and post-implementation audit of processes that are identified factors in insulin safety (Box 2). Glucometrics[13] assessment was also undertaken to determine impact on glucose control, an outcome measure.

Methods

System change

A locally proven methodology was used.[10] A statewide expert panel, including endocrinologists, advanced trainees, pharmacists, physicians, diabetes educators and medication safety nurses, was engaged to design prescribing and administration forms for insulin. Two forms were designed, one for intravenous insulin and one for subcutaneous insulin, with BGL monitoring incorporated into both forms (see *pages 442 and 443*). Safety features and enabling functions were incorporated into the forms and are listed in Box 2. Consensus and available evidence guided the development. Throughout the iterative process, the forms were assessed using prescribing and administration scenarios on medical students and clinical staff, with varying experience and expertise in diabetes management. Staff involved included interns, junior house officers and registrars, pharmacists, nursing staff from medical and surgical wards and diabetes educators. The assessments were carried out before piloting the forms and when significant format changes were applied.

A decision support tool for the management of hypoglycaemia was developed and incorporated (see *page 444*). The form also incorporated

2 Safety features

Subcutaneous insulin prescribing and administration form	Intravenous insulin infusion ordering and administration form
Route of administration clearly identified	Route of administration clearly identified
Notification prompts for blood glucose levels outside target range	Notification prompts for blood glucose levels outside target range
"Units" pre-printed	"Units" pre-printed
Multidisciplinary communication facilitated	Promotion of hourly blood glucose level monitoring
Discouragement of stand-alone subcutaneous "sliding scale"	Pre-printed blood glucose level ranges
Ability to prescribe supplemental insulin	Recommended initial insulin infusion rates
Insulin administration associated with meal by pre-printing mealtimes	Standard insulin concentration

prompts to encourage the use of supplemental insulin and discourage the use of short-acting insulin as sole therapy.

Site-based project officers implemented the forms and provided education to hospital staff over 8 weeks.

Measuring the effect of system change

The complex nature of insulin management has led to difficulties in determining appropriate measures to evaluate the effectiveness of the system change. In view of this, two audits were undertaken before implementation of the new forms.

- Documentation audit, measuring:
  - type of insulin regimen prescribed;
  - clarity of insulin prescribing and potential opportunities for error as a result of unclear prescribing;
  - clarity and correctness of documentation of administration of ordered insulin doses; and
  - documentation of treatment in response to hypoglycaemic and hyperglycaemic episodes.
- Blood glucose control audit, using Glucometrics,[13] in which:
  - the date and time of BGLs were collected retrospectively. BGLs on the day of admission were excluded.
  - there was no minimum timeframe for recording BGLs for intravenous insulin, with a maximum of 72 hours, at any time during the admission.
  - BGLs from a minimum of 48 hours and a maximum of 72 hours duration within the first 4 days of the admission were recorded for subcutaneous insulin- and non-insulin-treated streams;
  - The BGL data were separated into treatment streams of intravenous or subcutaneous insulin- and non-insulin-treated BGL monitoring. The data were entered into a spreadsheet and converted to milligrams per decilitre using a conversion factor of 18 and then uploaded following the required formatting to the Medical Informatics page of the Yale School of Medicine website. The report provided by the Yale website included both percentage of mean BGLs over inpatient days in range, and percentage of patient days where there was any hypoglycaemic (BGL < 3.9 mmol/L) event or any hyperglycaemic event (BGL > 16.6 mmol/L).

The audits were repeated at the same hospitals 3 months after the implementation.

Data collection

Data were collected at four Queensland Health tertiary and regional hospitals using a convenience sample. There were 117 patients in the pre-implementation audit and 82 patients in the post-implementation audit. All wards were included in each hospital except paediatrics, mental health and intensive care units. Audits were undertaken on separate days in each ward within a 1-week period. Data on intravenous and subcutaneous treatment streams were collected independently and a single patient could contribute to both collections. However, no patient had their data collected twice by virtue of a change in ward during the audit period.

The data from all patients having BGLs recorded who met the above criteria were included.

Analysis

Pre- and post-implementation data were analysed using χ^2 to test for significance of difference between two independent proportions. When χ^2 assumptions were not met, Fisher's Exact Test was used. The tests for the alternative hypotheses were two-tailed. Probability was set at $P < 0.05$.

Results

The results are displayed in Boxes 3 to 7 with proportions pre and post implementation of the Intravenous and Subcutaneous Insulin Prescribing and Administration forms. Box 3 lists the type of subcutaneous insulin treatment used in the study. Box 4 and Box 5 report the results of the intravenous documentation audit and the subcu-

3 Type of subcutaneous insulin treatment

Type of insulin treatment	Pre (%)*	Post (%)*	*P* (two tailed)
Routine subcutaneous insulin	34/45 (75.6)	42/49 (85.7)	ns
Subcutaneous sliding scale	10/45 (22.2)	8/49 (16.3)	ns
Supplemental insulin	2/45 (4.4)	14/49 (28.6)	0.002

* Proportions are pre and post implementation of the Intravenous and Subcutaneous Insulin Prescribing and Administration forms. ns = not significant.

4 Intravenous insulin documentation audit results

	Criteria	Pre (%)*	Post (%)*	*P* (two tailed)
Intravenous insulin prescribing	Clear regimen documented (no use of "u", legible, clear blood glucose level ranges)	21/40 (52.5)	24/26 (92.3)	= 0.0009
	Start time documented	5/40 (12.5)	19/26 (73.1)	< 0.0002
Intravenous insulin administration	Insulin infusion rates recorded by nurse (hourly recording expected)	644/1151 (56.0)	455/661 (68.8)	< 0.0002
	Infusion rate documented incorrectly	120/1151 (10.4)	37/661 (5.6)	= 0.0004
	Infusion rate documented is unclear	356/1151 (30.9)	6/661 (0.9)	< 0.0002
	Infusion rate documented is missing (with hourly expectation)	461/1151 (40.1)	202/661 (30.6)	< 0.0002

* Proportions are pre and post implementation of the Intravenous and Subcutaneous Insulin Prescribing and Administration forms.

5 Subcutaneous insulin documentation audit results

	Criteria	Pre (%)*	Post (%)*	*P* (two-tailed)
Subcutaneous insulin prescribing	*Opportunity for administration error as*			
	Result of unclear order	87/208 (41.8)	30/245 (12.2)	< 0.0002
	Result of unclear route	157/208 (75.5)	12/245 (4.9)	< 0.0002
	Result of unclear frequency	137/208 (65.9)	16/245 (6.5)	< 0.0002
Subcutaneous insulin administration	*Dose documented*			
	Incorrectly	8/208 (3.9)	15/245 (6.1)	ns
	Unclear	21/208 (10.1)	7/245 (2.9)	0.0014
	Missing	20/208 (9.6)	31/245 (12.7)	ns

* Proportions are pre and post implementation of the Intravenous and Subcutaneous Insulin Prescribing and Administration forms. ns = not significant.

taneous documentation audit respectively. Responses to hypoglycaemic and hyperglycaemic episodes are displayed in Box 6. Finally, blood glucose control, pre and post implementation, as measured by Glucometrics is shown in Box 7.

Discussion

An absolute difference of 24.2% in the post compared with the pre audit for the use of supplemental insulin was significant (Fisher's Exact Test, $P = 0.002$). The use of supplemental insulin at higher

6 Documentation of response to hypoglycaemia and hyperglycaemia

	Criteria	Pre %*	Post %*	*P* (two tailed)
Hypo- and hyperglycaemia (IV/ subcutaneous/ monitoring)	Hypoglycaemia notified to MO (BGL less than 4 mmol/L)	0/38 (0.0)	3/23 (13.0)	0.05
	Follow up BGL documented 15 mins following hypoglycaemia	3/38 (7.9)	6/23 (26.1)	ns
	Follow up BGL documented within 60 mins following hypoglycaemia	17/38 (44.7)	8/23 (34.8)	ns
	Hyperglycaemia notified to MO (BGL greater than 15 mmol/L)	7/100 (7.0)	7/122 (5.7)	ns

* Proportions are pre and post implementation of the Intravenous and Subcutaneous Insulin Prescribing and Administration forms. MO = medical officer. BGL = blood glucose level. ns = not significant.

7 Glucometrics audit

	Intravenous insulin			Subcutaneous insulin			BGL monitoring only		
	Pre*	Post*	Significance	Pre*	Post*	Significance	Pre*	Post*	Significance
No. of patients	27	12		42	59		37	21	
No. of BGLs	644	517		473	708		393	195	
No. of patient days	72	37		114	170		110	55	
% BGLs between 3.9 and 8.27 mmol/L	44.4 (32/72)	29.7 (11/37)	ns	46.5 (53/114)	41.8 (71/170)	ns	61.8 68/110	72.7 40/55	ns
% any BGL < 3.9 mol/L	6.9 (5/72)	5.4 (2/37)	ns	8.8 (10/114)	8.8 (15/170)	ns	8.2 (9/110)	3.6 (2/55)	ns
% any BGL >16.6 mmol/L	16.7 (12/72	24.3 (9/37)	ns	21.1 (24/114)	14.1 (24/170)	ns	7.3 (8/110)	3.6 (2/55)	ns

* Proportions are pre and post implementation of the Intravenous and Subcutaneous Insulin Prescribing and Administration forms. ns = not significant. BGL = blood glucose level.

rates is encouraged as part of the intensive treatment for improved glycaemic control in hospitalised patients with hyperglycaemia.[4]

The following significant improvements were demonstrated in several aspects of insulin prescribing and administration following the implementation of both the Intravenous and Subcutaneous forms.

Intravenous insulin form

- Improvement in the clarity of insulin prescribing by:
  - pre-printing "units" into the prescribing area and providing pre-printed standardised blood glucose ranges, reducing the risk of unclear ranges and illegibility of the order. The documentation of clear regimens in the pre audit was 52.5% and in the post audit was 92.3% ($P = 0.0009$);
  - documentation of start time for orders ($P < 0.0002$);
- An increased number of infusion rates documented as administered ($P < 0.0002$);
- A reduction in the number of incorrect ($P = 0.0004$), unclear ($P < 0.0002$) and missing ($P < 0.0002$) infusion rates documented as administered.

Subcutaneous insulin form

- Improvement in the clarity of subcutaneous insulin prescribing by the introduction of form functions that:

- prevent or minimise the use of non-standard abbreviations ($P < 0.0002$);
- clearly indicate the frequency (timing) of the insulin dose by associating it with a meal ($P < 0.0002$);
- clearly indicate the intended route of administration ($P < 0.0002$).

- Improvement in the clarity of administered insulin doses ($P = 0.0014$).

The notification of hypoglycaemia to a medical officer was also significantly improved. The documentation of appropriate management of hypoglycaemia incorporating repeated BGLs at 15 minutes and 60 minutes did not reach statistical significance, but the sample sizes were small. Hyperglycaemia notification did not improve, highlighting that alert criteria are necessary but not sufficient. To address this, the most recent iterations of the forms include decision support so that nursing staff have a clear indication of the response to expect and medical staff are guided in managing such alerts.

There was a clinically important reduction in hypoglycaemia with the use of the intravenous insulin form. While there was no improvement in other Glucometrics results, this was not the aim of the intervention and these results demonstrate that improvements in the safety of insulin prescribing and administration can be achieved without deterioration in BGL control. Decision support for medical officers to follow in the event of a high or low BGL notification was not included in this iteration of the form. The form has now been modified to incorporate prescribing decision support.

Glucometrics allowed robust assessment of improvements in glucose control. Improvements in other aspects of insulin administration documentation were harder to ascertain, as documentation in use before the introduction of the new forms did not allow determination of whether the dose had been calculated correctly.

Both forms have subsequently been introduced to about 70% of public hospital beds in Queensland. Therefore, we are now in a position to promote the forms to medical, nursing and pharmacy schools in Queensland such that they can ensure that their graduates are familiar with the forms' features and gain practical experience in their use before graduation.

Limitations

Consistent with the pragmatic approach to development and introduction of the new forms, this was not a randomised trial. No adjustments were made for possible differences in clinical, staffing or other resource factors. Data from all hospitals were pooled and between-hospital differences were not assessed. Observation bias could also have occurred, although the impact of this is unlikely to have been significant as insulin prescribing and administration were undertaken by many clinical staff and the audit periods were not advised in advance. Follow-up data at 12 months will be collected to determine sustainability of the changes.

Conclusion

This study demonstrates that improvements in insulin prescribing, documentation of administration and some important aspects of insulin and blood glucose management can be achieved through form design and structured implementation packages. To our knowledge, this is the first report of standardisation of insulin management and forms across a statewide public hospital system. The results demonstrate that large scale clinical standardisation projects can be successful.

Further work is required to address the quality management of diabetes and insulin. It is expected that this will require improved decision support introduced with change management support and attention to workplace issues, including resources, longstanding work practices and culture.

Audits including the use of Glucometrics will enable us to evaluate whether or not the subsequent interventions have resulted in further improvements in management.

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Competing interests

The authors declare that they have no competing interests.

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INSULIN INTRAVENOUS INFUSION ORDER AND BLOOD GLUCOSE RECORD - ADULT

Facility:

Ward:

(Affix patient identification label here and overleaf)

URN:

Family name:

Given names:

Address:

NOT A VALID PRESCRIPTION UNLESS IDENTIFIERS PRESENT

Date of birth: Sex: ☐ M ☐ F

First Prescriber to Print Patient Name and Check Label Correct:

BGL Frequency

☐ **Hourly** ☐ 2 hourly*

*(only if BGL is within target range for at least 6 hours. If any alteration in insulin infusion rate, IV fluids or TPN revert to hourly BGLs.)

Special instructions:

Review need for IV Insulin infusion daily before 12 midday. If continuing, rewrite on new page.

Target BGL range:
(generally 5.1-10 mmol/L)

..... mmol/L to

..... mmol/L

20.... Day/Month Time																							
BGL Record (mmol/L) Notify MO if: • BGL < 5 mmol/L • BGL > 15 mmol/L • 3 consecutive BGL readings > 10 mmol/L If BGL < 4 mmol/L treat hypoglycaemia	20 15 10 5 4 3 2	NOTIFY > 15 NOTIFY ≤ 5																					
BGL reading																							
Insulin infusion rate (Units/hr)																							
Meal/Snack bolus (units given)																							
Nurse(s) initials																							
Ketones / Hypo intervention																							
Dr notified																							

RECOMMENDED INITIAL INSULIN INFUSION RATES for ADULTS ONLY *(prescribe below)*:

0 - 5 mmol/L	5.1 - 7 mmol/L	7.1 - 10 mmol/L	10.1 - 15 mmol/L	15.1 - 20 mmol/L	> 20 mmol/L
Suspend insulin infusion, continue glucose and notify Dr	0.5 units/hr	1 unit/hr	2 units/hr	3 units/hr	4 units/hr

Important Information About IV Insulin

- All patients on IV Insulin must have continuous IV glucose infusion unless specified by MO - see chart
- Run IV insulin and glucose through same line
- Review IV insulin once oral intake resumes
- Certain situations require tighter BGL control (eg pregnancy)
- Refer to specialist if Ketoacidosis, Hyperosmolar nonketotic coma (HONK) or if patient requires IV insulin > 24hrs
- If patient needs subcutaneous insulin, must start before ceasing IV insulin

INTRAVENOUS ACTRAPID® INSULIN INFUSION ORDER

DATE/START TIME	/ :	/ :	/ :
BGL range (mmol/L)	**Initial Infusion Rate**	**Revised Infusion Rate**	**2nd Revised Infusion Rate**
0 – 5 or	*SUSPEND insulin infusion, continue glucose and notify Dr to review insulin infusion rate. If BGL < 4 mmol/L treat hypoglycaemia. Recheck BGL after 15 mins.*		
5.1 – 7 or	..... units/hr	..... units/hr	..... units/hr
7.1 – 10 or	..... units/hr	..... units/hr	..... units/hr
10.1 – 15 or	..... units/hr	..... units/hr	..... units/hr
15.1 – 20 or	..... units/hr. Notify Dr	..... units/hr. Notify Dr	..... units/hr. Notify Dr
> 20 or	..... units/hr. Notify Dr	..... units/hr. Notify Dr	..... units/hr. Notify Dr
Meal/Snack Bolus *(if required)*	Meal bolus: ..... units Snack bolus: ..... units	Meal bolus: ..... units Snack bolus: ..... units	Meal bolus: ..... units Snack bolus: ..... units
Dr Signature			
Print Name			

NURSING ADMINISTRATION RECORD Insulin IV Infusion

Insulin (units) and Sodium Chloride 0.9% (mL)	Date/time commenced	Nurse 1	Nurse 2	Time Stop	Volume Infused (mL)
50 units Actrapid® Insulin + 49.5mL Sodium Chloride 0.9%					
50 units Actrapid® Insulin + 49.5mL Sodium Chloride 0.9%					
50 units Actrapid® Insulin + 49.5mL Sodium Chloride 0.9%					

DO NOT WRITE IN THIS BINDING MARGIN

(Affix patient identification label here)

URN:

Family name:

Given names:

Address:

Date of birth: Sex: ☐ M ☐ F

NOT A VALID PRESCRIPTION UNLESS IDENTIFIERS PRESENT

First Prescriber to Print Patient Name and Check Label Correct:

Initial BGL Frequency ☐ Standard (Pre-meals and 21:00 hrs) ☐ 02:00 hrs ☐ 2hrs post-meal ☐ Other:

If BGL frequency not instructed, default is "Standard"

ALERTS: Notify Dr or **MO if:**

BGL less than 4 mmol/L and treat Hypoglycaemia;

BGL greater than mmol/L OR **any** BGL greater than 20 mmol/L;

BGL greater than 15 mmol/L on 2 consecutive readings.

Special Instructions:

Insulin treatment prior to admission (if any)
(document reason for change in clinical notes):

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INSULIN **SUBCUTANEOUS** ORDER AND BLOOD GLUCOSE RECORD - ADULT

Facility/Service: Year: 20

Ward/Unit:

MONITORING AND ADMINISTRATION RECORD

Date

Change BGL frequency to — ☐ Standard ☐ 02:00 hrs ☐ 2hrs post-meal ☐ Other (specify): Diet:

Time

Blood Glucose Levels (mmol/L)

NOTIFY > 20

20

15

10

5

NOTIFY < 4

BGL

Ketones/Hypo Intervention

Dr Notified

ADMINISTRATION RECORD

Write insulin type
Check for all routine supplemental/variable/ stat orders

Insulin type:

Insulin type:

Insulin type:

Insulin type:

If for any reason insulin cannot be administered as ordered enter code Ⓦ, notify Dr and document in clinical record

Nurse 1 initial

Nurse 2 initial

Comments:

ROUTINE INSULIN ORDERS

Mealtime insulin is given at start of meal

Contact MO for "Boxed" doses or if BGL out of range

Date: / / / / /

Meal / time: Type of insulin: units

Prescriber Signature: Print your name: initials

Meal / time: Breakfast Type of insulin: units

Prescriber Signature: Print your name: initials

Meal / time: Lunch Type of insulin: units

Prescriber Signature: Print your name: initials

Meal / time: Dinner Type of insulin: units

Prescriber Signature: Print your name: initials

Meal / time: Pre-Bed Type of insulin: units

Prescriber Signature: Print your name: initials

Meal / time: Type of insulin: units

Prescriber Signature: Print your name: initials

SUPPLEMENTAL / VARIABLE INSULIN ORDERS

Meal/time: *(with meals or 6 hourly)*

Type of insulin:

Sliding scale insulin is NOT recommended as sole insulin therapy, consider basal insulin needs

If the BGL (mmol/L) is: Date: / / / / /

0.0 - 4	or	**then administer** (units):	0	0	0	0	0
4.1 - 8	or		units	units	units	units	units
8.1 - 12	or		units	units	units	units	units
12.1 - 16	or		units	units	units	units	units
16.1 - 20	or		units	units	units	units	units
> 20 (and notify Dr)	or		units	units	units	units	units

Prescriber Signature: Print your name: initials initials initials initials initials

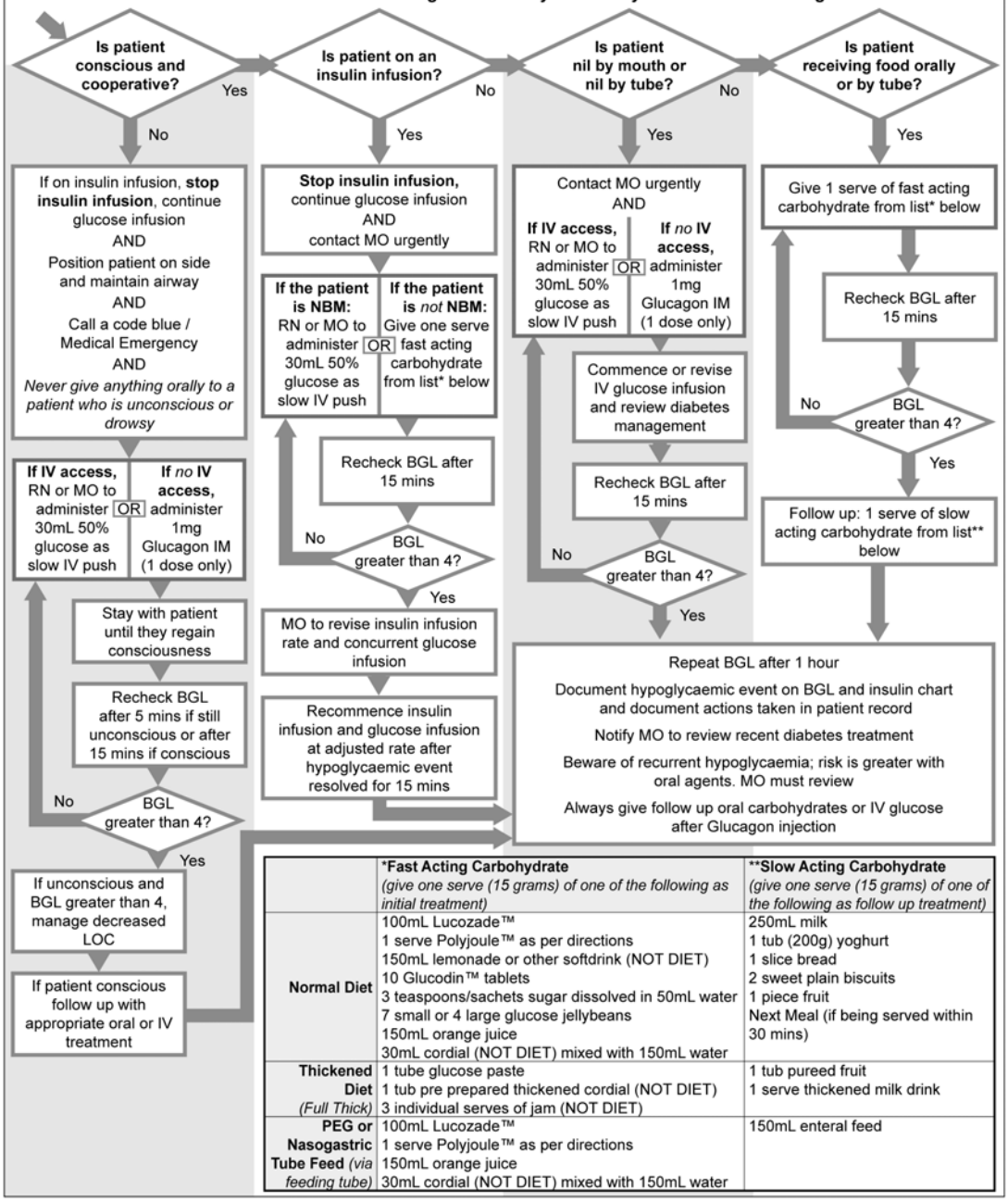
STAT / PHONE INSULIN ORDERS

Date prescribed	Type of insulin	Units	Date/time of dose	Prescriber Signature	Prescriber Print your name	Phone Order Nurse 1 / 2
		units				
		units				
		units				
		units				
		units				
		units				
		units				

Hypoglycaemia Management in Diabetes: BGL Less than 4mmol/L

If patient cannot or will not take oral carbohydrates, use intravenous glucose.

Remember - Rule of 15: Test BGL and treat with 15 grams carbohydrate every 15 mins until BGL is greater than 4mmol/L.



	*Fast Acting Carbohydrate *(give one serve (15 grams) of one of the following as initial treatment)*	**Slow Acting Carbohydrate *(give one serve (15 grams) of one of the following as follow up treatment)*
Normal Diet	100mL Lucozade™ 1 serve Polyjoule™ as per directions 150mL lemonade or other softdrink (NOT DIET) 10 Glucodin™ tablets 3 teaspoons/sachets sugar dissolved in 50mL water 7 small or 4 large glucose jellybeans 150mL orange juice 30mL cordial (NOT DIET) mixed with 150mL water	250mL milk 1 tub (200g) yoghurt 1 slice bread 2 sweet plain biscuits 1 piece fruit Next Meal (if being served within 30 mins)
Thickened Diet *(Full Thick)*	1 tube glucose paste 1 tub pre prepared thickened cordial (NOT DIET) 3 individual serves of jam (NOT DIET)	1 tub pureed fruit 1 serve thickened milk drink
PEG or Nasogastric Tube Feed *(via feeding tube)*	100mL Lucozade™ 1 serve Polyjoule™ as per directions 150mL orange juice 30mL cordial (NOT DIET) mixed with 150mL water	150mL enteral feed

Diabetes treatment review following treated hypoglycaemia

1. Assess patient – provide basic and advanced life support if required
2. Review diabetes management for causes of hypoglycaemia and correct avoidable causes
   a. If the cause is identified and corrected (e.g. missed, delayed or reduced intake), insulin dose adjustment is not required unless hypoglycaemia recurs
   b. If the cause is not identified or cannot be corrected and:
      i. hypoglycaemia has occurred **within** 4 hours after mealtime insulin, reduce the dose of **that** mealtime insulin by 20% the following day,
      ii. If hypoglycaemia has occurred **outside** 4 hours after mealtime insulin reduce basal insulin dose by 20%
3. If on insulin, and eating normally, **do not withhold subsequent mealtime or basal insulin** after treating hypoglycaemia.
   a. If reduced oral intake consider reducing mealtime insulin dose(s)
4. If on a sulphonylurea, **obtain specialist advice on management** as hypoglycaemia can be recurrent or prolonged
   a. Monitor BGL hourly for 4 hours and 4 hourly for 24 hours after last hypoglycaemic episode
   b. If recurrent hypoglycaemia, commence IV glucose, titrating rate to BGL greater than 4 mmol/L
   c. Withhold oral hypoglycaemic treatment until recovered and review whether further therapy is contraindicated