

Effect of Diabetes Care on Surgical Outcomes or Peri-operative Glucose Control - Is it Important?

Dr Ketan Dhatariya MSc MD MS FRCP Consultant in Diabetes and Endocrinology Norfolk and Norwich University Hospitals



Data from Public Health England

- People with diabetes are
 - Less likely to be offered day case surgery
 - More likely to have emergency surgery
 - Have a longer LOS following surgery
 - Have higher rates of 28-day readmissions following surgery

Norfolk and Norwich University Hospitals Do Peri-Operative High Glucose Levels Cause Harm?

- High pre-operative glucose or HbA1c has been related to adverse outcomes following
 - spinal surgery
 - vascular surgery
 - colorectal surgery
 - cardiac surgery
 - trauma
 - mastectomies
 - foot and ankle

- neurosurgery
- transplant surgery
- HBP surgery
- cholecystectomy
- cardiac surgery

Walid MS et al J Hosp Med 2010;5:E10-E14 O'Sullivan CJ et al Europ J of Vasc Endovasc Surg 2006;32:188-197 Gustafsson UO et al Brit J Surg 2009;96:1358-1364 Halkos ME et al Ann of Thorac Surg 2008;86:1431-1437 Kreutziger J et al J Trauma 2009;67(4):704-8 Vilar-Compte et al Am J Infect Control 2008;36(3):192-198 Park C et al Transplantation 2009;87(7):1031-1036 Ambiru S et al J Hosp Infect 2008;68(3):230-233 Chaung SC et al J Formos Med Ass 2004;103(8):607-612 Shibuya N et al J Foot Ankle Surg 2013;52(2):207-211



Excess Mean Length of Stay in Diabetes Inpatients Aged 18 – 60 Years

269,265 Diabetes Discharges and 4,411,593 Matched Controls

	Mean LOS (days)			Excess LOS (days)			n	
	E10	E11	С	E10	E11	E10	E11	С
Surg.	5.4 (0.1)	5.1 (0.1)	4.2 (0.2)	1.2	0.9	18,032	32,135	1,501,453
Т &О	4.8 (0.1)	5.3 (0.2)	4.6 (0.1)	0.2	0.7	8,178	12,203	885,606
GM	4.8 (0.2)	5.4 (0.2)	4.4 (0.1)	0.4	1.0	70,988	82,446	1,709,553
Card.	4.2 (0.1)	4.2 (0.1)	3.8 (0.1)	0.4	0.4	5,307	15,009	229,784
MFE	4.8 (0.2)	4.8 (0.2) 5.6 (0.2) 4.7 (0.1)			0.1	2,444	4,549	85,197
	E10 = Type 1 diabetes			E11 = 1	Type 2 of	diabetes	c = con	trols
	English	Hospitals	, 4 conse	ecutive y	ears of	discharges	s 2000-20	04
			Sampson	MJ et al Dia	abetes Re	esearch & Clini	cal Practice	2007;77(1):92-98

NHS Foundation Trust

Day Case Avoidance

0-15 16-24 25-34 35-44 45-54 55-64 65-74	Admissions for males with diabetes 956 1,633 3,289 10,014 27,487 60,788 87,207	Admissions per 1000 males with diabetes 99 51 51 70 93 122 210 241	Admissions per 1000 males without diabetes 50 43 57 57 79 118 203 355	Diabetes admissions/non- diabetes admissions 1.99 1.20 1.24 1.18 1.04 1.04 1.04	Excess admissions in diabetes 475 274 627 1,511 994 2,148 -41,187	
75+	77,832	328	413	0.79 0.82 (age	-20,344	
All male	269,206	205	123	adjusted)	-55,501	
	Admissions for females with diabetes	Admissions per 1000 females with diabetes	Admissions per 1000 females without diabetes	Diabetes admissions/non- diabetes admissions	Excess admissions in diabetes	
0-15	975	106	40	2.63	604	
16-24	1,986	58	62	0.94	-136	
25-34	3,708	79	91	0.87	-567	
35-44	10,390	190	118	1.61	3,942	ļ
45-54	23,708	172	160	1.08	1,736	
55-64	42,589	202	207	0.97	-1,184	'
65-74	61,743	233	288	0.81	-14,657	
75+	62,924	213	279	0.76	-19,748	-
All female	208,023	197	137	0.87 (age adjusted)	-30,011	
Total (male and female)	477,229	202	130	0.85 (age- adjusted)	-85,512	

Men

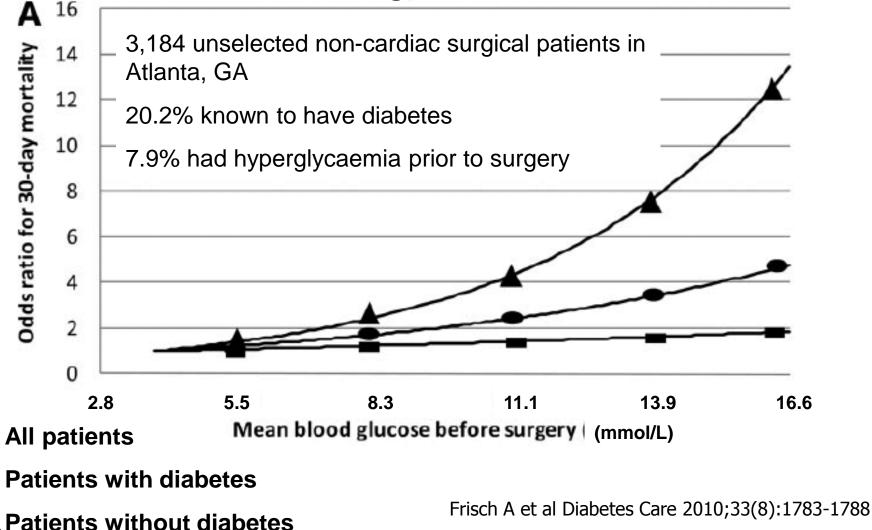
In 2009-10, 85,512 people with diabetes were denied day case surgery. If 1 bed day costs £300, then this equates to £25.6m

Women

Kerr M, 'Inpatient Care for People with Diabetes: the Economic Case for Change'. NHS Diabetes 2012

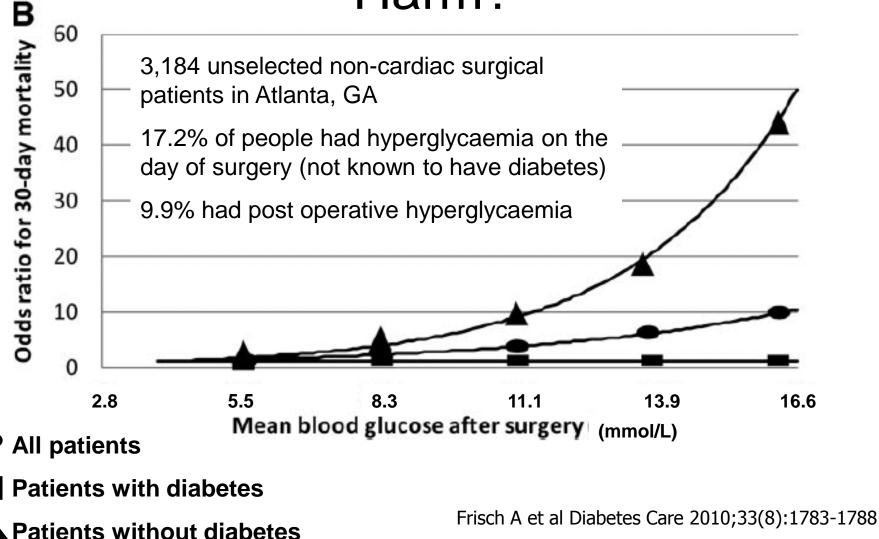
NHS Foundation Trust

Do High Glucose Levels Cause Harm?



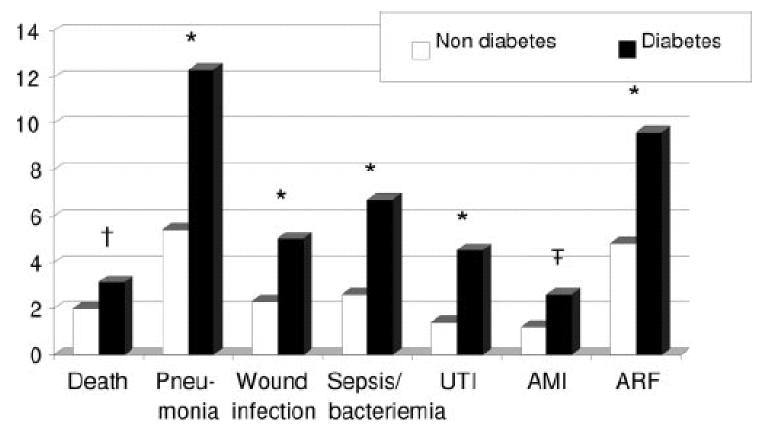
NHS Foundation Trust

Do High Glucose Levels Cause Harm?



NHS Foundation Trust

Do High Glucose Levels Cause Harm?



Frisch A et al Diabetes Care 2010;33(8):1783-1788



NHS Foundation Trust

More Observational Data

- Observational data from 55 US hospitals over 5 years looked at the outcomes of 18,278 patients 11,633 of whom who had a BG measured pre op, on day 1 post op or day 2 post op
- 55.4 ± 15.3 years
- 65.7% women



NHS Foundation Trust

Hyperglycaemic Individuals

- Were more likely to be
 - Older
 - Heavier
 - More comorbidities
 - Have longer operations
 - Have diabetes (but not always)

NHS Foundation Trust

Outcomes

TABLE 2. Adjusted Multivariate Logistic Regression Analysis on the Effect of Perioperative Hyperglycemia (>180 mg/dL at Any Point on the Day of Surgery, Postoperative Day 1, or Postoperative Day 2) on Outcomes Presented as Odds Ratio and 95% Confidence Intervals (Within Parenthesis)

	Composite Infections (n = 491)	Deaths (n = 48)	Reoperative Interventions (n = 257)	Anastomotic Failures (n = 43)	Myocardial Infarctions (n = 13)
Hyperglycemia	2.0 (1.63–2.44)	2.71 (1.72-4.28)	1.8 (1.41-2.3)	2.43 (1.38-4.28)	> 1.15 (0.43-3.1)

High glucose levels were associated with poor outcomes

Diabetes[§]

Noninsulin-dependent	0.51 (0.37-0.69)	0.48 (0.25-0.93)	0.63 (0.44-0.9)	0.45 (0.21-0.99)	0.77 (0.15-4.08)
Insulin-dependent	0.52 (0.35-0.76)	0.78 (0.36-1.68)	0.54 (0.35-0.85)	0.49 (0.18-1.32)	1.66 (0.26-10.71)

But - having diabetes was protective (?increased vigilance)

Kwon S et al Ann Surgery 2013;257(1):8-14

NHS Foundation Trust

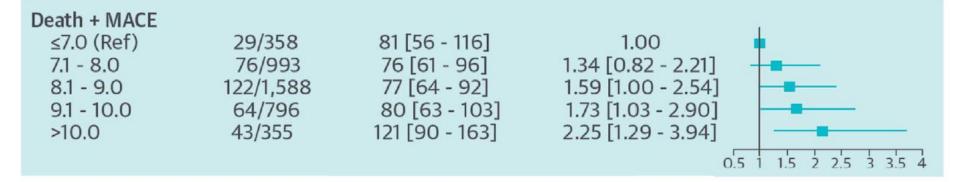
Cardiac Surgery?

- 352 patients (150 without diabetes)
- Randomised to 5.6-7.8 vs 7.9-10 mmol/l post CABG
- 90 day outcomes (death, infections, etc)
- Most benefit achieved in those without diabetes on the intensive treatment arm (p=0.008)



NHS Foundation Trust

HbA1c and Outcome Post CABG

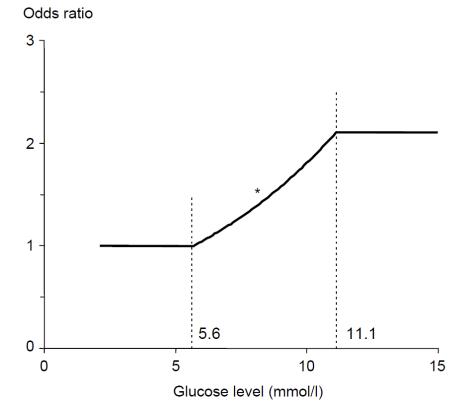


- 764 patients with T1DM undergoing CABG between 1997-2012 in Sweden
- For every 1% (9mmol/mol) rise in pre-operative HbA1c above 7% (53mmol/mol), there was an 18% increase in mortality or MACE



In Addition....

 Other data has confirmed the harm of high preoperative glucose levels in non-cardiac, non vascular surgery



30 day mortality rates for 989 patients with diabetes – for each mmol/L increase in blood glucose, OR for mortality rose by 1.19 (CI 1.1 - 1.3)

Noorddij PG et al EJE 2007;156(1):137-142



NHS Foundation Trust

Benefits of Glucose Control Extend to Those Without Diabetes

- 2383 people undergoing cardiac surgery randomised to tight peri- or post-operative glycaemic control (4.4-6.1 mmol/l)
- Those without diabetes had the greatest benefit in reductions complications
 - -CV
 - Pulmonary
 - Neurological
 - GI
 - Renal



Thus....

- Whilst there is data to show that poor glycaemic control is associated with poor outcomes
- There is no consistent data to show that improving control also improves outcomes

(A bit like diabetes care in general until the mid 1990's)

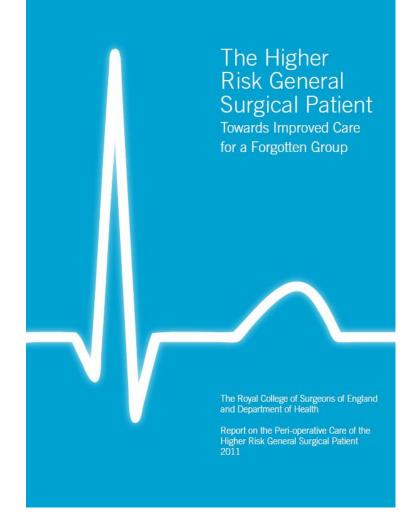
Norfolk and Norwich University Hospitals The ITU Story NHS Foundation Trust

2001 Leuven (Surgical) 1548 Positive Van den Berghe G et al NEJM 2001;345:1359-1367 1200 Neutral / Positive 2006 Leuven (Medical) Van den Berghe G et al NEJM 2006;354:449-461 2008 VISEP (Septic) 537 Stopped early Brunkhorst FM et al NEJM 2008;358:125-139 Neutral De La Rosa G et al Critical Care 2008;12:R120 2008 De la Rosa (General) 504 2009 GluControl 1078 **Stopped early / Neutral** Preiser J-C et al Intensive Care Medicine 2009 35:1738-1748 2009 Leuven (PICU) 700 Positive Vlasselaers D et al Lancet 2009;373:547-556 Harmful (especially hypos) / Neutral (TBI) 2009/12/15 NICE-SUGAR 6104 The NICE-SUGAR Study Investigators NEJM 2009;360:1283-1297 NEJM 2012;367:1108-1118 Intensive Care Medicine 2015;41(6):1037-1047 2012 Boston Children's 980 Neutral Agus MS et al NEJM 2012;367(13):1208-1219 Neutral (hypos) Macrae D et al NEJM 2014;370(2):107-108 2014 CHiP (PICU) 1369 Neutral (hypos) Kalfon P et al Intensive Care Med 2014;40(2):171-181 2014 CGAO-REA 2684 Canotti R et al Critical Care 2014;18:498 "The jury is still out" Van den Berghe G Intensive Care Med 2013;39(5):823-825



Norfolk and Norwich University Hospitals **NHS Foundation Trust**

Something Some of You May Have Seen



Disappointingly, the word 'diabetes' appears only once, 'hyperglycaemia' and 'glucose' do not appear at all in this document

http://www.rcseng.ac.uk/publications/docs/higher-risk-surgical-patient/





In 2011 Along Came This.....

Management of adults with diabetes undergoing surgery and elective procedures: improving standards

http://www.diabetologists-abcd.org.uk/JBDS/JBDS.htm

Supporting, Improving, Caring



How to Access This

- Open your search engine of choice
- Type in 'ABCD' and 'JBDS'
- Click on the first link

NHS Foundation Trust

🔍 100% 👻

	▼ A http://www.d	diabetologists-					
iii yee <							ب ج (
trade et et et	25 September 2015	an 🏫 ۱	YHPHO - Variation in Inpatient A 🗼 diabetologists-abcd.org.uk 🛛 🗙				
Image: Contract and public production of product and public product of product	<u>View</u> F <u>a</u> vorites	<u>T</u> ools <u>H</u> el	þ				
<section-header><image/><image/><image/><image/><image/><image/><image/></section-header>	• T <u>o</u> ols • 🕢 •						
<section-header><image/><image/><image/><image/><image/><image/><image/></section-header>						Member Login Committee Login Forgotten	Password Contact Us
<section-header><image/><image/><image/><text><text><text><text></text></text></text></text></section-header>	Meetings Posi	tion Daners	Besearch and Audit Education ABCD on N3 ABCD Journa				
<image/> <text><text><text><text><text><text><text></text></text></text></text></text></text></text>	T Meetings [1 osie	don'n apera		1 (00040)			
<image/> <text><text><text><text><text><text><text></text></text></text></text></text></text></text>			Associat	ion of	British Clinical Diabetologists	A	
Documents Action British Diabetes Societies (BDDS) for Inpatient Care group was created in 2008 to 'deliver's set of diabetes impatient guidelines and proposed standards of care within secondary care organisations,' within the care pathways. The BIDS - 1P group was created and control to be babetes Inpatient diabetes care to hugh quality evidence based guidelines, and through better impatent care pathways. The BIDS - 1P group was created and control to be babetes Inpatient Specialist Nurse (DISN) UK group, and works with NHS England, TREND-UK and with other professional organisations. Links Materian Diabetes (ASDD) Control Contro Contro Contro Contr	Carlo A		ASSOCIAT		British Childar Diabetologists		
Documents Action British Diabetes Societies (BDDS) for Inpatient Care group was created in 2008 to 'deliver's set of diabetes impatient guidelines and proposed standards of care within secondary care organisations,' within the care pathways. The BIDS - 1P group was created and control to be babetes Inpatient diabetes care to hugh quality evidence based guidelines, and through better impatent care pathways. The BIDS - 1P group was created and control to be babetes Inpatient Specialist Nurse (DISN) UK group, and works with NHS England, TREND-UK and with other professional organisations. Links Materian Diabetes (ASDD) Control Contro Contro Contro Contr						ARCN	
Data British Diabetes Societies (BBDS) for Inpatient Care groups was created in 2008 to "deliver a set of diabetes inpatient guidelines and proposed standards of are within secondary care organisations", while the biabetes are through the development and use of high quality evidence based guidelines, and through better inpatient care pathways. The BDS - IP group was created and improving inpatient diabetes created provide by Diabetes UK, ASD on the Diabetes Inpatient Speciality Nurse (DISN) UK group, and works with NHS England, TREND-UK and with other professional organisations. British Diabetes Societies (BDS) for Inpatient diabetes are through the development and use of high quality evidence based guidelines, and through better inpatient care pathways. The BDS - IP group was created and Diabetes Federation (DISN) British Diabetes Societies (BDS) for Trabited Second (BAS) British Diabetes Societies (BDS) British Diabetes Soc					BDS-IP Diabetes Societies		
Data British Diabetes Societies (BBDS) for Inpatient Care groups was created in 2008 to "deliver a set of diabetes inpatient guidelines and proposed standards of are within secondary care organisations", while the biabetes are through the development and use of high quality evidence based guidelines, and through better inpatient care pathways. The BDS - IP group was created and improving inpatient diabetes created provide by Diabetes UK, ASD on the Diabetes Inpatient Speciality Nurse (DISN) UK group, and works with NHS England, TREND-UK and with other professional organisations. British Diabetes Societies (BDS) for Inpatient diabetes are through the development and use of high quality evidence based guidelines, and through better inpatient care pathways. The BDS - IP group was created and Diabetes Federation (DISN) British Diabetes Societies (BDS) for Trabited Second (BAS) British Diabetes Societies (BDS) British Diabetes Soc							
The Joint British Diabetes Societies (1905) for Inpatient Care group was created in 2008 to 'deliver as at database and proposed standards of are within secondary care organisations', with the vorall ain minimpriving inpatient madu use high using using endence based guidelines, and fromposed standards of are within secondary care organisations', with the suported by Diabetegisting the development and use high using using endence based guidelines, and fromposed standards of are within secondary care organisations', with the suported by Diabetegisting the development and use high using using endence based guidelines, and fromposed standards of are within secondary care organisations', with the Society for Endocrinology Toreal ain minimpriving inpatient and use for high using endence based guidelines, and fromposed standards of are within secondary care organisations', with the Society for Endocrinology Toreal ain formation in the state (DISM) UK group, and works with hits England, TREMO-UK and with other professional organisations. For Society for Endocrinology The guidelines produced by the 1805 - 1P group (including those planned for the future) are listed below and for those already published click the live link on the date to view: Note For Society for Endocrinology	1	Joint Britis	h Diabetes Societies (JBDS) for Inpatient Care Group				Add new link
Decements overall aim of improving inpatient diabetes care through the development and use of high quality evidence based guidelines, and through better inpatient care pathways. The JBDS - IP group was created at particular	7	The Joint Brit	itish Diabetes Societies (JBDS) for Inpatient Care group was created in	2008 to 'deliver	a set of diabetes inpatient quidelines and proposed standards of care within secondary care organisations', with the		
Image: control with the link better in product backet with and the control with the control work with NHS England, TREND-UK and with other professional organizations. Databete control with the link better in professional control work with NHS England, TREND-UK and with other professional organizations. Databete control with the link better in professional control work with NHS England, TREND-UK and with other professional organizations. Databete control work with NHS England, TREND-UK and with other professional organizations. Databete control work with NHS England, TREND-UK and with other professional organizations. Image: Control work with the link better in professional organization with databets with databets in professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. Databete control work with NHS England, TREND-UK and with other professional organization. <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
Concisions with a second action of diabets in horizonia in adults with diabetes - State, 2013 - Remark Concernent - State, 2014 - Remark Concernent - Remark Concerne - Remark Con						Diabetes UK (DUK)	
Subleme The guidelines produced by the JBDS - IP group (including those planned for the future) are listed below and for those already published click the live link on the date to view: Nex Subjects	s	supported by	y Diabetes UK, ABCD and the Diabetes Inpatient Specialist Nurse (DISN) UK group, and	works with NHS England, TREND-UK and with other professional organisations.	Society for Endocrinology	
Number The guidelines produced by the JBDS - IP group (including those planned for the future) are listed below and for those already published click the live link on the date to view: No. Guidelines Date No. Guidelines March 2010 2 The management of hypocycamia in adults with diabetes - Sath. 2012 2 The management of diabetic ketsociosis (GKA) in adults - writed - Sath. 2012 2 The management of diabetic ketsociosis (GKA) in adults - writed - Sath. 2012 3 Management of adults with diabetes in hospital March 2013 4 Saff management of guidelines undrogoin surgery - corrently March 2012 5 Amanagement of diabetic ketsociosis (GKA) in adults with diabetes Other 3 Management of adults with diabetes Other 4 Saff management of diabetic ketsociosis (GKA) in adults with diabetes Other 9 Otherament of hypocyconoline hisplaten Non 2012 <t< td=""><td>CGo</td><td></td><td></td><td></td><td></td><td>European Association for the Study of Diabetes (EASD)</td><td></td></t<>	CGo					European Association for the Study of Diabetes (EASD)	
Underlines The guidelines produced by the JBDS - IP group (including those planned for the future) are listed below and for those already published click the live link on the date to view: No. Guideline Guideline Date No. Guideline diftion 2013 March 2010 2 The management of hypogycamia in adults - with diabetes - send. 2013 Send. 2013 2 The management of diabetic kateoadiosis (DKA) in adults - with diabetes - send. 2013 Send. 2013 2 The management of diabetic kateoadiosis (DKA) in adults - with adults - with diabetes - send. 2013 Send. 2013 2 The management of diabetic kateoadiosis (DKA) in adults - with adul		a . I I:				American Diabetes Association (ADA)	
The guidelines produced by the JBDS - IP group (including those planned for the future) are listed below and for those already published <i>click the live link on the date to view:</i> No. Guideline Date 1 Hospital management of hypoplycamia in adults with diabetes March 2010 1 Hospital management of diabetic ketoacidosis (DKA) in adults March 2010 2 The management of diabetic ketoacidosis (DKA) in adults March 2010 2a The management of diabetic ketoacidosis (DKA) in adults March 2013 2b Adult diabetic ketoacidosis mergency care pathway to use in the case Sept. 2013 2 The management of diabetic ketoacidosis (DKA) in adults March 2011 3 Management of adults with diabetes Sept. 2013 4 Self management of diabetic ketoacidosis (DKA) in dults March 2011b 4 Self management of diabetic meral feeding in stroke June 2012 6 Management of diabetes Nov. 2012 8 Stroid use for inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes In progress 12 Diabetes on the renal unit In progress 13 Diabetes on the renal unit In progress 13 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
No. Guideline Date 1 Hospital management of hypoglycaemia in adults with diabetes March 2010 1a Hospital management of hypoglycaemia in adults with diabetes Statk. 2013 2 The management of aduletic kateacidosis (OKA) in adults March 2010 2a The management of diabetic kateacidosis (OKA) in adults Statk. 2013 2b Adult diabetic kateacidosis (OKA) in adults Statk. 2013 3 Management of adulets with diabetes Statk. 2013 4 Self management of adules trivited quickling in stroke June 2012 6 Management of diabetes in hospital March 20110 4 Self management with diabetes Dout 2012 6 Management of Hypersyntamic State (HHS) Auust 2012 7 Admisiona Swomolar Hypersyntamic State (HHS) Nov. 2013 8 Steroid use for inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes In progress 12 Diabetes on the real unit In progress 13 Diabetes on the real unit In progress 12 Diabetes on the real unit In progress 13 Diabetes on the real unit In progress 13 Diabetes on the enalunit In progress 1	т	The guideline	es produced by the JBDS – IP group (including those planned for the fu	ture) are listed	elow and for those already published click the live link on the date to view:		
No. Cuideline Date 1 Hospital management of hypoglycarmia in adults with diabetes March 2010 2 The management of hypoglycarmia in adults with diabetes Sapt. 2013 2 The management of diabetic ketoacidosis (DKA) in adults March 2010 2a The management of diabetic ketoacidosis (DKA) in adults March 2010 2a The management of diabetic ketoacidosis (DKA) in adults Sapt. 2013 2b Adult diabetic ketoacidosis (DKA) in adults Sapt. 2013 2b Adult diabetic ketoacidosis (DKA) in adults Sapt. 2013 2b Adult diabetic ketoacidosis (DKA) in adults Sapt. 2013 2b Adult diabetic ketoacidosis (DKA) in adults Sapt. 2013 3 Management of adults with diabetes Sapt. 2013 4 Saft management of adults with diabetes June 2012 6 Management of diabetic subject (HIS) Auut. 2012 7 Admissiona subject (NRC) for medical inpatients with diabetes Nov. 2013 8 Steroid use for inpatients with diabetes Nov. 2013 9 Variable rate insulin infusion (WRI) for medical inpatients with diabetes In progress 10 Dischess on the real with In progress 12 Diabetes on the real with In progress 13							
1 Hospital management of hypocytexmia in adults with diabetes March 2010 1a Hospital management of hypocytexmia in adults with diabetes Sack 2013 revised - second adition 2013 March 2010 2 The management of diabetic ketacaidois (DKA) in adults March 2010 2a The management of diabetic ketacaidois (DKA) in adults - revised - Sack 2013 2b Adult diabetic ketacaidois (DKA) in adults - revised - Sack 2013 2b Adult diabetic ketacaidois (DKA) in adults - revised - Sack 2013 3 Management of adults with diabetes undergoing surgery - currently March 2012 4 Self management of Hypeogyteamics State (HHS) August 2012 5 Glycaemic management with diabetes Nov. 2013 7 Admissiona suciance in diabetes Nov. 2013 8 Steriol use for inpatients with diabetes Oct. 2014 10 Dischers net with diabetes Oct. 2014 10 Dischers net main in Multins (WII) for medical inpatients with diabetes Oct. 2014 10 Dischers net main in Multins (WII) for medical inpatients with diabetes In progress 13 Diabetes on the real unit In progress <td< td=""><td></td><td></td><td>outlettee</td><td>D-1-</td><td>1</td><td></td><td></td></td<>			outlettee	D-1-	1		
1a Hoppilar management of hypoglycamia in adults with diabetes - Sant. 2013 2 The management of diabetic katoacidosis (DKA) in adults - revised - second addition 2013 March 2010 2a The management of diabetic katoacidosis (DKA) in adults - revised - second addition 2013 March 2010 2b Adult diabetic katoacidosis (DKA) in adults - revised - gathcay to use in the case - second addition 2013 Second addition 2013 3 Management of failuts with diabetes undergoing surgery - currently - March 2011a March 20113 4 Self management of diabetic kind additime 2012 March 20112 5 Glycaemic management dung enteral feeding in stroke - June 2012 June 2012 6 Management of Hypeglycaemic State (HHS) - August 2012 Admissiona surgerent dung enteral feeding in stroke - Nov. 2013 9 Variable rate insulin invision (VRI) for medical inpatients with diabetes - Nov. 2013 Oct. 2014 10 Discherse planning for papele with diabetes - In progress In progress 11 VRII for inpatients with edie versione - In progress In progress 13 Diabetes on the real unit In progress		1			4		
revised - second edition 2013 March 2010 2 The management of diabetic ketoacidosis (DKA) in adults - revised Sept. 2013 2a The management of diabetic ketoacidosis (DKA) in adults - revised Sept. 2013 2b Adult diabetic ketoacidosis (DKA) in adults - revised Sept. 2013 2b Adult diabetic ketoacidosis (DKA) in adults - revised Sept. 2013 3 Management of adults vith diabetes undergoing surgery - currently March 2012 4 Self management of diabetis with diabetes June 2012 6 Management of Hypersynamics State (HHS) August 2012 7 Admissions avoidance in diabetes Nov. 2013 8 Sterrid use for inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes In progress 11 VRII for inpatients with adults In progress 12 Diabetes on the real unit In progress 13 Diabetes on the real unit In progress		1a					
2a The management of diabetic ketoacidosis (DKA) in adults - revised - scond adition 2013 Saot. 2013 2b Adult diabetic ketoacidosis emergency care pathway to use in the case longs - accompanies the DKA revised quideline 2013 Saot. 2013 3 Management of adults with diabetes undergoing surgery - currently being revised March 2011b March 2011b 4 Self management of adults with diabetes in hospital March 2012 March 2012 5 Glycaemic management of Hypergycaemic State (HHS) August 2012 6 Management of Hypergycaemic State (HHS) August 2012 7 Admissions avoidance in diabetes Nov. 2013 8 Sterrid use for inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes Oct. 2014 10 Diabetes on the renal unit In progress 12 Diabetes on the real unit In progress 13 Diabetes on the real unit In progress			revised - second edition 2013			Doctors.net.uk	
second edition 2013 2b Adult diabetic kebacidosis emergency care pathway to use in the case notes - accompanies the DKA revised guideline 2013 3 Management of adults with diabetes undergoing surgery - currently heing revised March 2011b March 2012b 4 Self management of diabetes in hospital March 2012b 5 Giycamic management during enteral feeding in stroke June 2012 August 2012 6 Management of Hyperosmolar Hyperglycamic State (HHS) August 2012 August 2012 7 Admissions avoidance in diabetes Nov. 2013 Oct. 2014 9 Variable rate insulin infusion (VRI) for medical inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes Oct. 2014 In progress 11 VRII for inpatients with adultes to cornany syndromes and diabetes In progress 13 Diabetes on the renal unit In progress 13 Diabetes on the renal unit In progress		2				Other	
notes accompanies the DKA revised guideline 2013 3 Management of dubts with diabetes undergoing surgery - currently being revised March 2011a March 2012 4 Self management of diabetes in hospital March 2012 5 Glycaemic management of under feeding in stroke Dure 2012 6 Management of Hypersonolir Hyperglycaemic State (HS) August 2012 7 Admissions avoidance in diabetes Nov. 2013 8 Steroid use for inpatients with diabetes Nov. 2013 9 Variable rate insulin infusion (VRII) for medical inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes In progress 11 VRII for inpatients with adletes In progress 13 Diabetes on the renal unit In progress 13 Diabetes on the delivery suite In progress		2a	The management of diabetic ketoacidosis (DKA) in adults - revised - second edition 2013	Sept. 2013			
notes accompanies the DKA revised guideline 2013 3 Management of dubits with diabetes undergoing surgery - currently March 2011a 4 Self management of diabetes in hospital March 2011a 5 Glycamic management during enteral feeding in stroke Dure 2012 6 Management of typersonicant Hyperglycamic State (HHS) August 2012 7 Admissions avoidance in diabetes Nov. 2013 8 Steroid use for inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes Oct. 2014 10 Discharge planning for people with diabetes In progress 11 VRII for inpatients with adubetes In progress 13 Diabetes on the renal unit In progress 13 Diabetes on the delivery suite In progress		2b	Adult diabetic ketoacidosis emergency care pathway to use in the case	Sept. 2013			
being revised March 2011b 4 Self management of diabetes in hospital March 2012 5 Glycaemic management during enteral feeding in stroke June 2012 6 Management of Hypergylcaemic State (HHS) August 2012 7 Admissions avoidance in diabetes Nov. 2012 8 Steroid use for inpatients with diabetes Nov. 2012 9 Variable rate insulin infusion (VRII) for medical inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes In progress 11 VRII for inpatients with addites In progress 12 Diabetes on the renal unit In progress 13 Diabetes on the delivery suite In progress			notes - accompanies the DKA revised guideline 2013				
4 Self management of diabetes in hospital March 2012 5 Givcamic management during enteral fiseding in stroke June 2012 6 Management of Hypergrosemic State (HHS) August 2012 7 A dimissions avoidance in diabetes Nov. 2013 8 Steroid use for inpatients with diabetes Nov. 2014 9 Variable rate insulin infusion (VRII) for medical inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes In progress 11 VRII for inpatients with aduetes In progress 12 Diabetes on the renal unit In progress 13 Diabetes on the delivery suite In progress		3	Management of adults with diabetes undergoing surgery - currently	March 2011a			
5 Givcamic maragement during enteral fixeding in stroke June 2012 6 Management of Hyperosmolar Hyperglycaemic State (HHS) August 2012 7 A dimissions avoidables in diabetes Nov. 2012 8 Steroid use for inpatients with diabetes Nov. 2012 9 Variable rate insulin Infusion (VRII) for medical inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes In progress 11 VRII for inpatients with addiabetes In progress 12 Diabetes on the renal unit In progress 13 Diabetes on the delivery suite In progress		4	being revised Self management of diabeter in bornital				
6 Management of Hypergrussmic State (HHS) Audut 2012 7 Admissions avoidance in diabetes Nov. 2013 8 Steroid use for inpatients with diabetes Oct. 2014 9 Variable rate insulin Infusion (VURI) for medical inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes Inprogress 11 VIRI for inpatients with diabetes In progress 12 Diabetes on the renal unit In progress 13 Diabetes Net							
7 Admissions avoidance in diabetes Nov. 2013 8 Steroid use for inpatients with diabetes Oct. 2014 9 Variable rate insulin infusion (VRII) for medical inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes In progress 11 VKII for inpatients with cube corrany syndromes and diabetes In progress 12 Diabetes on the renal unit In progress 13 Diabetes on the delivery suite In progress							
9 Variable rate insulin infusion (VRII) for medical inpatients with diabetes Oct. 2014 10 Discharge planning for people with diabetes In progress 11 VRII for inpatients with cutoe coronary syndromes and diabetes In progress 12 Diabetes on the renal unit In progress 13 Diabetes on the delivery suite In progress			Admissions avoidance in diabetes	Nov. 2013			
10 Discharge planning for people with diabetes In progress 11 VRII for inpatients with acute coronary syndromes and diabetes In progress 12 Diabetes on the renal unit In progress 13 Diabetes on the delivery suite In progress							
11 VRII for inpatients with acute coronary syndromes and diabetes In progress 12 Diabetes on the renal unit In progress 13 Diabetes on the delivery suite In progress							
12 Diabetes on the renal unit In progress 13 Diabetes on the delivery suite In progress		11	VRII for inpatients with acute coronary syndromes and diabetes				
13 Diabetes on the delivery suite In progress							
14 Management of diabates in pendia with mental health issues In progress		13	Diabetes on the delivery suite	In progress			
		14		In progress	4		
15 Ulagnosing diabetes for the first time in inpatients In progress		15	Diagnosing diabetes for the first time in inpatients	In progress	J		
15 Diagnosing diabetes for the first time in inpatients In progress		13 14	Diabetes on the delivery suite Management of diabetes in people with mental health issues	In progress In progress			
		Guidelines	have been actively distributed (>21,000 copies, excluding downloads)				
Guidelines have been actively distributed (>21,000 copies, excluding downloads)							
• 85-100% responding teams were aware of the guidelines	•	• >90% ado	ption in 118 UK Trusts for older guidelines, and around 50% for 2012 g	uidelines			
			to be the second of the first second state of the second state of the first second state of the				
• 85-100% responding teams were aware of the guidelines	•	 Rated high 	ily in terms of patient safety, overall quality and clinical value				

The core members of JEDS-IP (listed below) include diabetes consultants and diabetes specialist nurses from across the UK, with all 4 nations represented. Twice yearly face to face meetings interspersed with

NHS Foundation Trust

And This.....

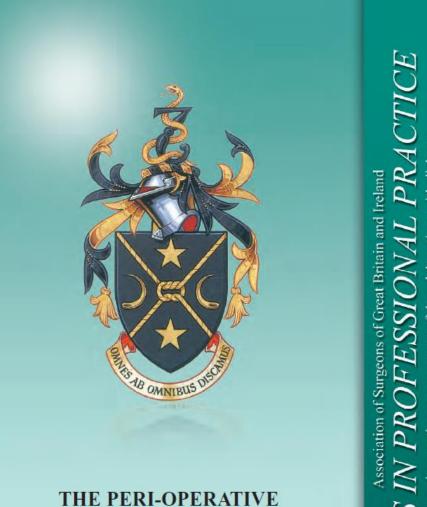
Diabetes UK Position Statements and Care Recommendations

NHS Diabetes guideline for the perioperative management of the adult patient with diabetes^{*}

K. Dhatariya¹, N. Levy², A. Kilvert³, B. Watson⁴, D. Cousins⁵, D. Flanagan⁶, L. Hilton⁷, C. Jairam⁸, K. Leyden³, A. Lipp¹, D. Lobo⁹, M. Sinclair-Hammersley¹⁰ and G. Rayman¹¹ for the Joint British Diabetes Societies

NHS Foundation Trust

And This.....



MANAGEMENT OF THE ADULT PATIENT WITH DIABETES

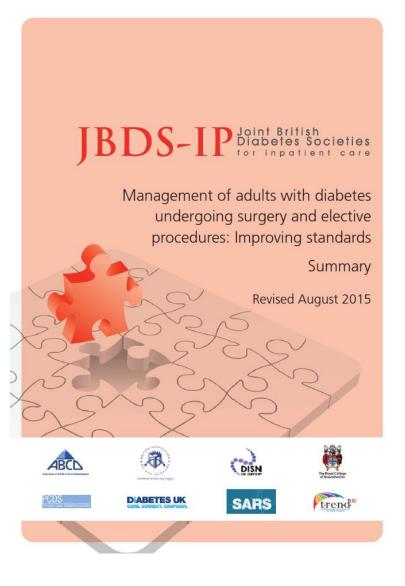
May 2012

http://www.asgbi.org.uk/en/publications/issues_in_professional_practice.cfm

perative management of the adult patient with diabete The per ISS!

NHS Foundation Trust

It Has Now been Updated



NHS Foundation Trust

National Guidelines

- Document divided into sections:
 - Primary care
 - Surgical outpatients
 - Pre-operative assessment clinic
 - Hospital admission
 - Theatre and recovery
 - Post-operative care
 - Discharge



NHS Foundation Trust

The Peri-Operative Management of Diabetes Drugs

NHS Foundation Trust

Hypoglycaemic Agents

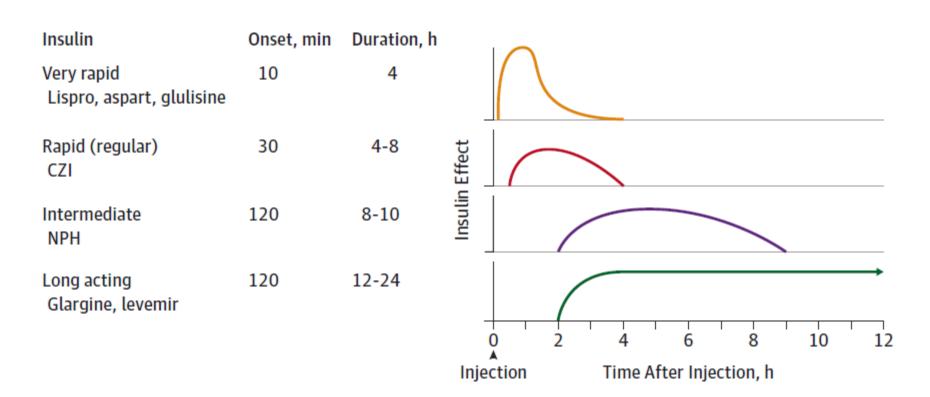
- α glucosidase inhibitors
- Metaglinides
- Metformin
- Sulphonylureas
- Thiazolidindiones
- GLP 1 analogues
- DPP IV inhibitors
- SGLT2 inhibitors

		Day of Surgery / whilst on a VRIII				
Tablets	Day prior to admission	Patient for AM surgery	Patient for PM surgery	If a VRIII is being used*		
Acarbose	Take as normal	Omit morning dose if NBM	Give morning dose if eating	Stop once VRII <u>I</u> commenced, do not recommence until eating and drinking normally		
Meglitinide (e.g repaglinide or nateglinide)	Take as normal	Omit morning dose if NBM	Give morning dose if eating	Stop once VRII <u>I</u> commenced, do not recommence until eating and drinking normally		
Metformin (eGFR is greater than 60ml/min/1.73m ² and procedure not requiring use of contrast media**)	Take as normal	If taken once or twice a day – take as normal If taken three times per day, omit lunchtime dose	If taken once or twice a day – take as normal If taken three times per day, omit lunchtime dose	Stop once VRII <u>I</u> commenced, do not recommence until eating and drinking normally		
Sulphonylurea (e.g glibenclamide, gliclazide, glipizide, etc.)	Take as normal	Once daily am omit Twice daily omit am	Once daily am omit Twice daily omit am and pm	Stop once VRII <u>I</u> commenced, do not recommence until eating and drinking normally		
Pioglitazone	Take as normal	Take as normal	Take as normal	Stop once VRII <u>I</u> commenced, do not recommence until eating and drinking normally		
DPP IV inhibitor (e.g. sitagliptin, vildagliptin, saxagliptin, alogliptin, linagliptin)	Take as normal	Take as normal	Take as normal	Stop once VRII <u>I</u> commenced, do not recommence until eating and drinking normally		
GLP-1 analogue (e.g. exenatide, liraglutide, lixisenatide, dulaglutide)	Take as normal	Take as normal	Take as normal	Take as normal		
SGLT-2 inhibitors (e.g. dapagliflozin, canagliflozin)	Take as normal	Omit on day of surgery	Omit on day of surgery	Omit on day of surgery		

NHS Foundation Trust

Insulin Durations

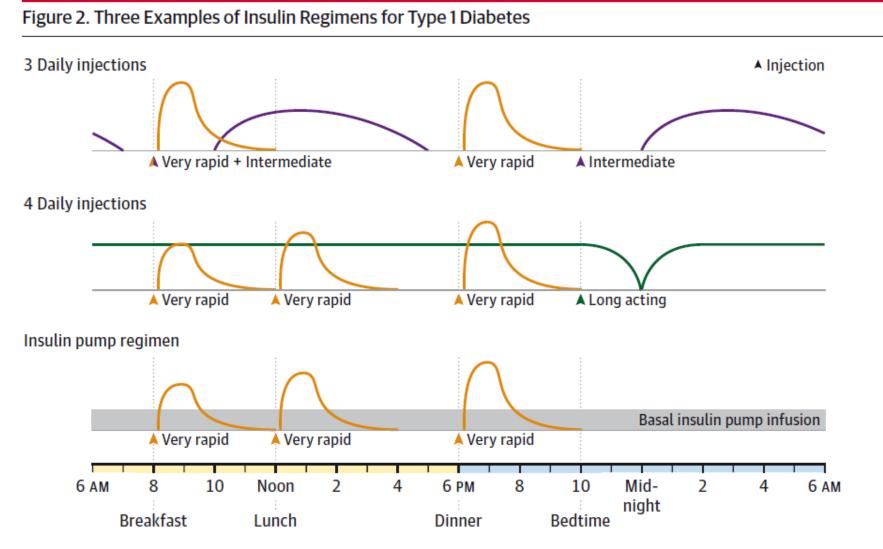
Figure 1. Insulin Activity Profiles



Nathan DM JAMA 2015;314(10):1052-1062

NHS Foundation Trust

Insulin Regimens

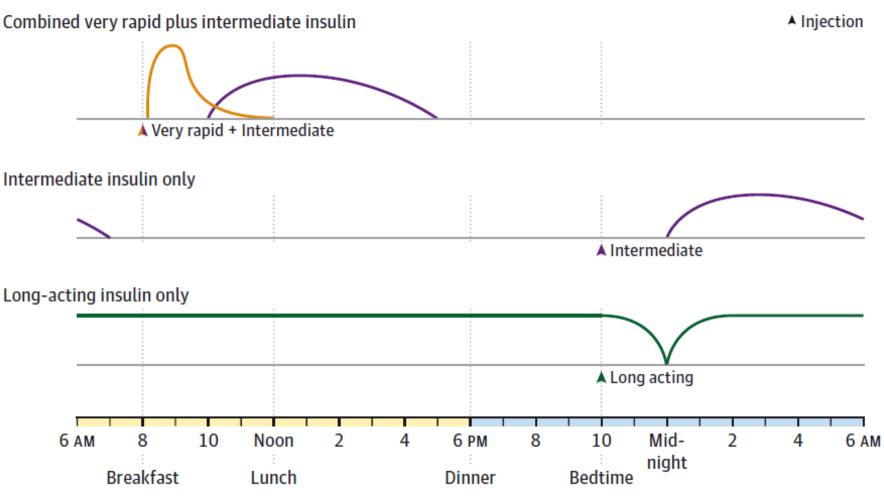


Nathan DM JAMA 2015;314(10):1052-1062

NHS Foundation Trust

Insulin Regimens

Figure 3. Three Examples of Single Injection Regimens for Type 2 Diabetes



Nathan DM JAMA 2015;314(10):1052-1062

	Day prior to admission	Day of Surgery / whilst on a VRIII			
Insulins		Patient for AM surgery	Patient for PM surgery	If a VRIII is being used*	
Once daily (evening) (e.g. Lantus® or Levemir® Tresiba® Insulatard® Humulin I®) Insuman®)	Reduce dose by 20%	Check blood glucose on admission	Check blood glucose on admission	Continue at 80% of the usual dose	
Once daily (morning) (Lantus® or Levemir® Tresiba® Insulatard® Humulin I®) Insuman®)	Reduce dose by 20%	Reduce dose by 20% Check blood glucose on admission	Reduce dose by 20% Check blood glucose on admission	Continue at 80% of the usual dose	
Twice daily (e.g. Novomix 30 [®] , Humulin M3 [®] Humalog Mix 25 [®] , Humalog Mix 50 [®] , Insuman [®] Comb 25, Insuman [®] Comb 50 twice daily Levemir [®] or Lantus [®])	No dose change	Halve the usual morning dose. Check blood glucose on admission Leave the evening meal dose unchanged	Halve the usual morning dose. Check blood glucose on admission Leave the evening meal dose unchanged	Stop until eating and drinking normally	
Twice daily - separate injections of short acting (e.g. animal neutral, Novorapid® Humulin S®) Apidra® and intermediate acting (e.g. animal isophane Insulatard® Humulin I® Insuman®)	No dose change	Calculate the total dose of both morning insulins and give half as intermediate acting only in the morning. Check blood glucose on admission Leave the evening meal dose unchanged	Calculate the total dose of both morning insulins and give half as intermediate acting only in the morning. Check blood glucose on admission Leave the evening meal dose unchanged	Stop until eating and drinking normally	
3, 4 or 5 injections Daily (e.g. an injection of mixed insulin 3 times a day or 3 meal time injections of short acting insulin and once or twice daily background)	No dose change	 Basal bolus regimens: omit the morning and lunchtime short acting insulins. Keep the basal unchanged.* Premixed a.m. insulin: halve the morning dose and omit lunchtime dose Check blood glucose on admission 	Take usual morning insulin dose(s). Omit lunchtime dose. Check blood glucose on admission	Stop until eating and drinking normally	





Effect of Diabetes Care on Surgical Outcomes or Peri-operative Glucose Control - Is it Important?

www.norfolkdiabetes.com

