Published References

Study	Population	Topic	Data Type/Source	Design	Logistics	Conclusions
Van den Berghe et al. NEJM, 2001 345(19): 1359-67 Leuven, Belgium	Adult Surgical ICU Ventilated	Glycemic control decreased M&M	Prospective chart review	Randomized, Controlled Intravenous Titration algorithm	Target BG: 80-110 mg/dL Vs. 180-200 mg/dL	- Mortality reduced: 10.6 vs. 20.2% - Bacteremia down by 46% - Renal Failure down by 41% - Transfusions down by 50% - Polyneuropathy down by 44%
Comments:	*Independent of DM Diagnosis*	*Independent of Severity of illness*	*Glycemic Control more influential than Insulin dose*	*N = 1548, 71% male 63 y.o.; BMI 26*		
Laver et al., Anesthesia Int Care, 32(3):311-6 2004 Bath, UK	Adult SICU	Pre and Post Protocol glycemic control	Retrospective Chart Audit	Observational pre and post intervention glucose levels Intravenous	BG: 2001 vs. 2002	- Pre: 9.2 mmol/l - Post: 6.2 mmol/l
Comments:						
Bode et al., Endocr Pract, 10 Suppli 2:71-80 2004 Atlanta GA	SICU, CCU	Indications and methods of IV insulin therapy	Review of 3 protocols, compare and contrast		Transition from IV to subcutaneous	-100 mg/dL in pregnancy -110 mg/dL in critically ill -140 mg/dL in other med-surg -180 mg/dL in failed sq insulin Rx
Comments:						*Protocol variation*
Goldberg et al., Diabetes Care, 2004, 27:461-467 Yale, New Haven	MICU	Nurse implementation Insulin infusion protocol	Restrospective Survey of staff satisfaction	Randomized, Controlled Intravenous	Target BG: 100 – 139 mg/dL	-Median time to achieve: 9hr -52% hit target range -66% clinically desirable (80-139) -93% clinically acceptable (80-199)
Comments:		*Easy to Use*		*~ 50% reached target*		*Clinically effective* *Time to target prolonged*
Brown, Dodek Crit Care Med, 29(9):1714-9 2001 Vancouver BC Canada	Adult Med-Surg ICU	Nurse managed Nomogram for insulin infusion	Retrospective	Pre and Post Cohort Observational Sliding scale SQ vs. Intravenous	Target BG: < 11.5 mmol/L	-4 hr for SQ vs. 2 hr for nomogram -AUC for SQ = 0.9 -AUC for nomogram = 0.3 -No difference in hypoglycemia
Comments:		*Easy to Use*	*Time to target short*			*Clinically effective*
Markovitz et al Endocr Pract, 8(1):10-8 2002 Mayo Health	Postoperative Cardiac Surgery with Diabetes	Glycemic management protocol	Prospective Chart review	Randomized, Controlled Comparison Without, and with protocol use	Target BG: ≤ 200 mg/dL	- Reduced Hospital days with BG ≥ 200 mg/dL (16.8% decreased from 38.4%)
Comments:						*SQ insulin was effective in some pts after transfer from ICU* *Time to target 2-4 days*

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Lewis et al., **Ann Pharmacother** **38(7-8):1243-51 2004** **Rush Pres, Chicago IL**	Critically ill	Data Review	Clinical reports with assessment of clinical outcomes MEDLINE, Cochrane 1996 - 2004	Literature review and data synthesis		-Mortality > 20% - Hyperglycemia, Sepsis and MOF common - M&M reduced with strict glycemic control
Comments:						*Monitor frequently for detection of hypoglycemia*
Zimmerman et al. **Ann Pharmacother** **38(7-8):1123-9, 2004** **Henry Ford, Detroit MI**	Critically ill Cardiothoracic surgery patients With or without Diabetes	Glycemic control via nurse-driven insulin infusion protocol	Retrospective vs. Prospective chart review	Pre (control) and Post cohort observational comparison N = 174 and 168 respectively		- 61% of TGC group met target range - 47% of control met target range - AUC of exposure > 150 mg/dL was 14.8 vs. 28.4 - Median time to target 2.1hr vs. 9.4 hr. - Hypoglycemia (< 60 mg/dL) 16.7% vs. 9.8%
Comments:	*TGC defined as 80-*	*150 mg/dL*				*Incidence of hypoglycemia of concern*
Gropper **Anesth Analg 99(2):566-72; 2004** **UCSF, CA**	Mortality reduction in Critically ill	Survival benefit and cost-effectiveness	Prospective Pharmacy costs and health care personnel hours	Literature review		- Budget neutral with improved survival benefit and other outcome measures
Comments:						*Evidence-based management is cost-effective and improves outcomes*
Malmberg **Endocr Pract 2004** **10 Suppli 2 :13-6 Karolinska Inst.** **DIGAMI-1** **Scheen et al** **Rev Med Liege 2004** **EASD** **DIGAMI-2**	Acute MI, DM	Insulin/glucose infusion for ≥ 24 hours after AMI	Prospective	Randomized, 2 arm	TGC defined as 80-110 mg/dL	

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Van den Berghe et al, Crit Care Med, 31(2):56-63 **2003 Leuven, Belgium**	Critically Ill	Outcomes	Prospective	Randomized, controlled Comparative outcomes	Insulin infusion for TGC (80 – 110 mg/dL) vs. SQ for GC conventional (180 – 200 mg/dL)	- BMI, DM Hx, admission DX, admission BG, caloric intake, duration of ICU stay independently Impacted on insulin doses - BG level predicted improved M&M more than insulin dose.
Comments:						*Hypoglycemia 5.2% vs. 0.8%* *Moderate glycemic control (110-150 mg/dL had worse outcomes than TGC.*
Umpierrez et al **J Clin Endocrinol Metab 87(3):978-82 2002** **U Tenn HSC, Memphis TN**	Un-diagnosed hyperglycemia General admission	In-hospital hyperglycemia Mortality	Retrospective review	Observational	FBG ≥ 126 mg/dL (7 mmol/L) or RBG ≥ 200 mg/dL (11.1 mmol/L) x 2 N = 2030	- 38% of admissions were hyper. - 12% had no Hx DM - New hyper mortality as 16% vs. 3% in known DM and normal. 1.7%. - New hyper > LOS, > ICU rate, < functional outcome.
Comments:						
Krinsley **Mayo Clin Proc, 78(8):992-1000 2004** **Stamford Hospital** **Stamford CT**	Critically ill adults SICU	Mortality	Prospective	Pre and Post comparative TGC intervention Convenience sampling	TGC BG < 140 mg/dL N = 800 pre N = 800 post	-Mean decrease from 152.3 mg/dL to 130.7 mg/dL -56.3 % reduction in ≥ 200 mg/dL -Decreased new renal insuff. 75% -Decreased pRBC transfusion 18.7% -Decreased mortality by 29.3% -Decrease LOS by 10.8%
Comments:						*Continuous IV for > 200 mg/dL*
Furnary, Wu & Bookin **Endocr Pract. 10 Suppl 2:21-33 2004** **Portland, OR**	Post op Cardiac CABG Dx of Diabetes	Outcomes: - Mortality - Deep Sternal wound infections - LOS - Hospital Cost	Prospective 17 years	Non-randomized convenience sampling Continuous Intravenous insulin therapy	TGC BG < 150 mg/dL N = 4,681	-Decreased mortality risk – 57% -Decreased wound infection risk – 66% -Mortality and infection rate normalized in diabetic patients
Comments:	*Portland Protocol*					*"Cost effective"*
Grey, Perdrizet **Endocr Pract. 2004** **10 Suppli 2:46-52** **Hartford CN**	Critically ill adults SICU Non- diabetic	Nosocomial Infection rate Mean BG values Mean Insulin doses	Prospective	Randomized controlled Standard Rx target: (180 – 200 mg/dL) Strict Insulin Rx target: (80 – 120 mg/dL)	BG ≥ 140 mg/dL were randomized: SRx N = 27 SIRx N = 34	-Decreased mean BG: 179 ± 61 vs. 125 ± 36 mg/dL -Decreased all infections -Increased hypoglycemia
Comments:						*Hypoglycemia (<60 mg/dL) 32% vs. 7.4%)*

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Finney et al **JAMA 290(15):2041-7 2003** **Royal Brompton, London, UK**	Critically ill Adult ICU	Mortality	Prospective	Observational	Target BG < 140 mg/dL N = 531	-ICU mortality: 5.2% -Hospital mortality: 5.7% -Significant BG levels: 111-140 mg/dL (6.1-8.0 mmol/L) -Mortality benefit below 144-200 mg/dL (8.0-11.1 mmol/L) with an upper limit of 145 mg/dL
Comments:						*Increased Insulin doses are associated with increased mortality*
Kanji et al. **Intensive Care Med 30(5):804-10** **2004** **Ottawa Ontario**	Adult ICU	Efficacy and safety of nurse managed TGC protocol	Prospective	Comparative Cohort MD order vs. insulin protocol	Target BG 4.5 – 6.1 mmol/L (81-110 mg/dL) N = 50 in each group	Time to target BG: 11.3 ± 7.9 hr vs. 16.4 ± 12.6 hr. Time within target BG: 11.5± 3.7 vs. 7.1± 5.0 hr Decreased hypoglycemia: 4% vs. 16%
Comments:						
Comments:						
Gordon et al **Ann Thorac Surg, 1998** **Cleveland Clinic, OH**	Adult SICU	Nosocomial infection rate, blood stream,	Retrospective	Comparative Cohort	N=681	6/1000 patient care days BSIs Mortality 37% vs. 2.5%
Comments:						
Laird et al **J Trauma, 56(5):1058-62** **2004** **Wake Forest U, NC**	Trauma	Mortality	Retrospective	Observational	BG ≥ 200 mg/dL	Independent predictor of infection and mortality
Comments:						
Pittas et al; Arch Intern Med. 2004 **164(18):2005-11**	Critically Ill		•	Meta-analysis of randomized controlled trials		