JAN BLÁHA

Klinika anesteziologie, resuscitace

a intenzivní medicíny

INZULINOTERAPIE V INTENZIVNÍ PÉČI

… když tisíckrát
opakovaný blud
se stává pravdou

1. lékařská fakulta UK

Všeobecná fakultní nemocnice

v Praze

K danému tématu nemám žádný konflikt zájmů.

Blaha J, et al. Perioperative tight glucose control reduces postoperative adverse events in non-diabetic cardiac surgery patients. *J Clin Endocrinol Metab. 2015 Aug;100(8):3081-9.*

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Blaha J, et al. Evaluation of the subcutaneous route for glucose monitoring in patients undergoing deep hypothermia. *Intensive Care Medicine,roč. 33,č. Suppl. 2,2007,s. S263-S263*

Blaha J, et al. Evaluation of the subcutaneous route for glucose monitoring in severe critically ill patients. *Book of abstracts, Praha,2006,s. 12-12*

31. května – přejmenování **Ostravského kraje** na **kraj Moravskoslezský**

(Brněnského na Jihomoravský, Budějovického na Jihočeský, Jihlavského na Kraj Vysočina)

12. prosince – zemřel **JOSEF BICAN**, legendární fotbalový útočník (*1913)

2001

15. ledna – zahájen projekt Wikipedia.

11. září – teroristický útok na USA

7. října – začala válka v Afghánistánu

2001

The New England
Journal of Medicine

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VOLUME 345 NOVEMBER 8, 2001 NUMBER 19

INTENSIVE INSULIN THERAPY IN CRITICALLY ILL PATIENTS

GREET VAN DEN BERGHE, M.D., PH.D., PIETER WOUTERS, M.SC., FRANK WEEKERS, M.D., CHARLES VERWAEST, M.D., FRANS BRUYNINCKX, M.D., MIET SCHETZ, M.D., PH.D., DIRK VLASSELAERS, M.D., PATRICK FERDINANDE, M.D., PH.D., PETER LAUWERS, M.D., AND ROGER BOUILLON, M.D., PH.D.

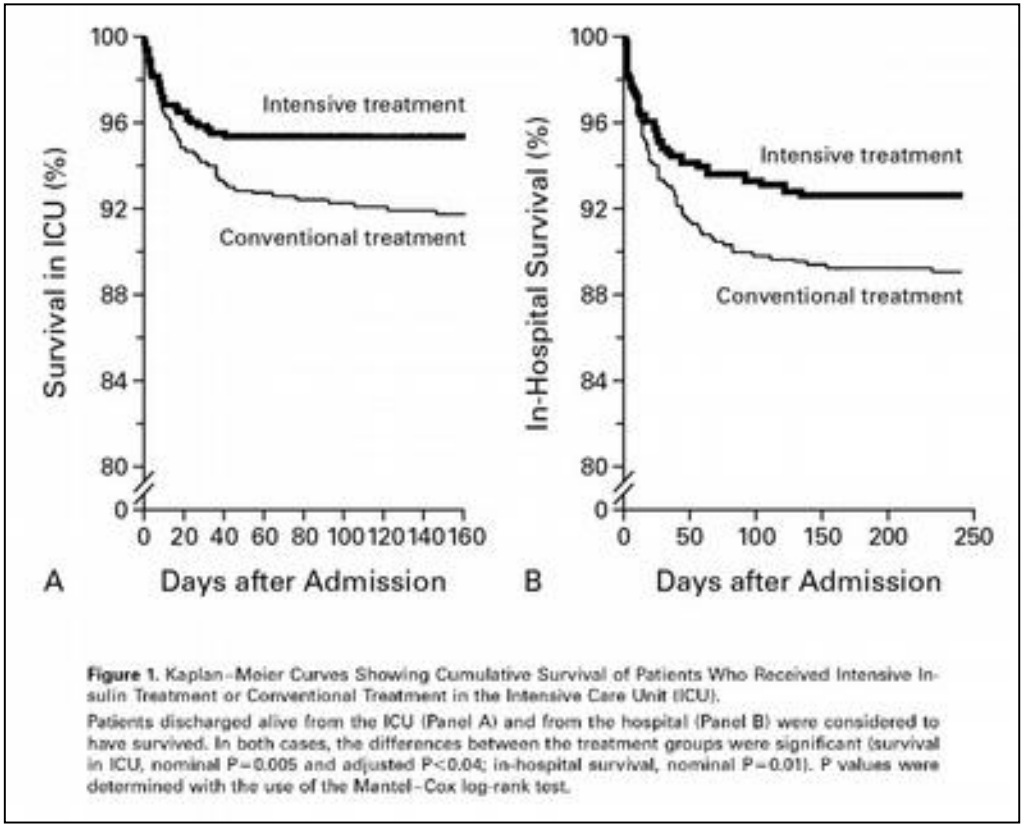
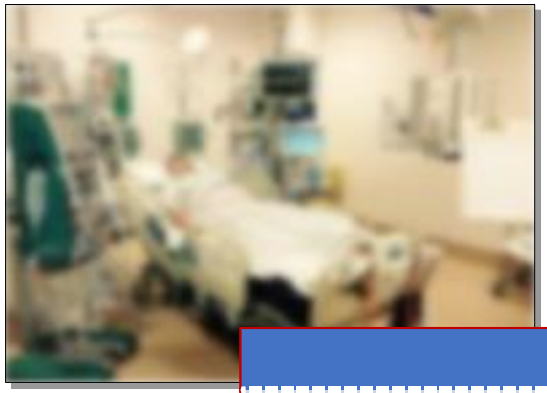
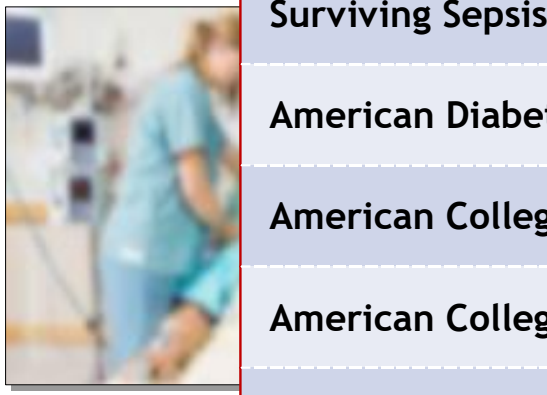
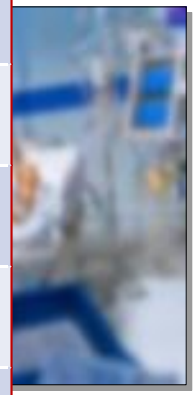
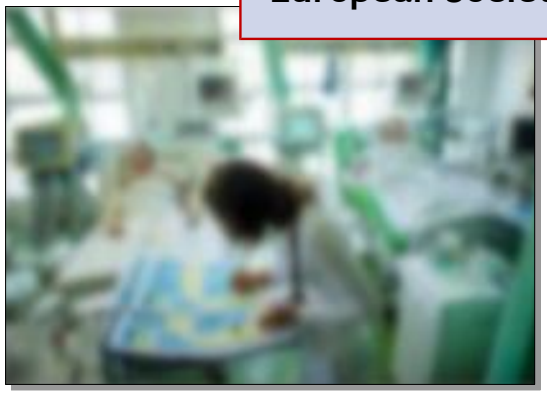
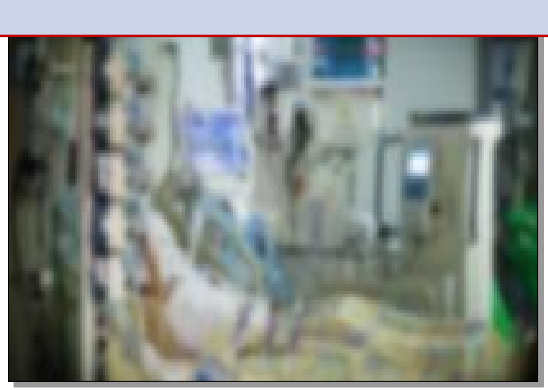


Figure 1. Kaplan–Meier Curves Showing Cumulative Survival of Patients Who Received Intensive Insulin Treatment or Conventional Treatment in the Intensive Care Unit (ICU).

Patients discharged alive from the ICU (Panel A) and from the hospital (Panel B) were considered to have survived. In both cases, the differences between the treatment groups were significant (survival in ICU, nominal $P=0.005$ and adjusted $P<0.04$; in-hospital survival, nominal $P=0.01$). P values were determined with the use of the Mantel–Cox log-rank test.



	doporučení
Surviving Sepsis Campaign	4.4-6.1 (<8.3)
American Diabetes Association	co nejblíže 6.1
American College of Endocrinology	<6.1
American College of Physicians	<10
European Society of Intensive Care Medicine	4.4-6.1


2006

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 FEBRUARY 2, 2006 VOL. 354 NO. 5

Intensive Insulin Therapy in the Medical ICU

Greet Van den Berghe, M.D., Ph.D., Alexander Wilmer, M.D., Ph.D., Greet Hermans, M.D., Wouter Meersseman, M.D., Pieter J. Wouters, M.Sc., Ilse Milants, R.N., Eric Van Wijngaerden, M.D., Ph.D., Herman Bobbaers, M.D., Ph.D., and Roger Bouillon, M.D., Ph.D.

Pouze když >3 dny

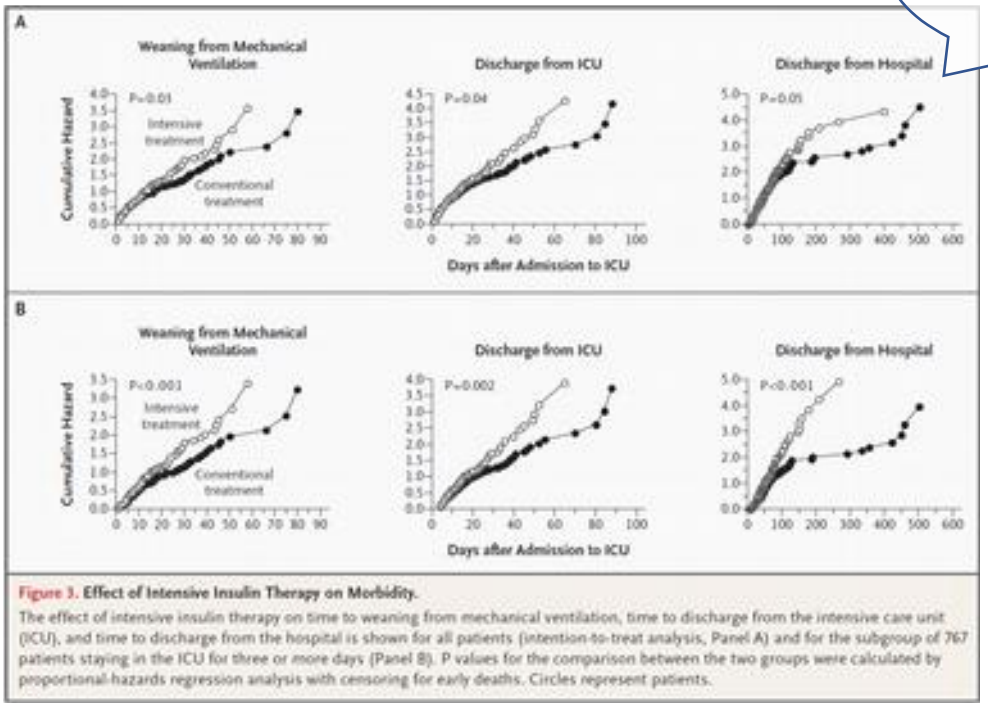


Figure 3. Effect of Intensive Insulin Therapy on Morbidity.

The effect of intensive insulin therapy on time to weaning from mechanical ventilation, time to discharge from the intensive care unit (ICU), and time to discharge from the hospital is shown for all patients (intention-to-treat analysis, Panel A) and for the subgroup of 767 patients staying in the ICU for three or more days (Panel B). P values for the comparison between the two groups were calculated by proportional-hazards regression analysis with censoring for early deaths. Circles represent patients.

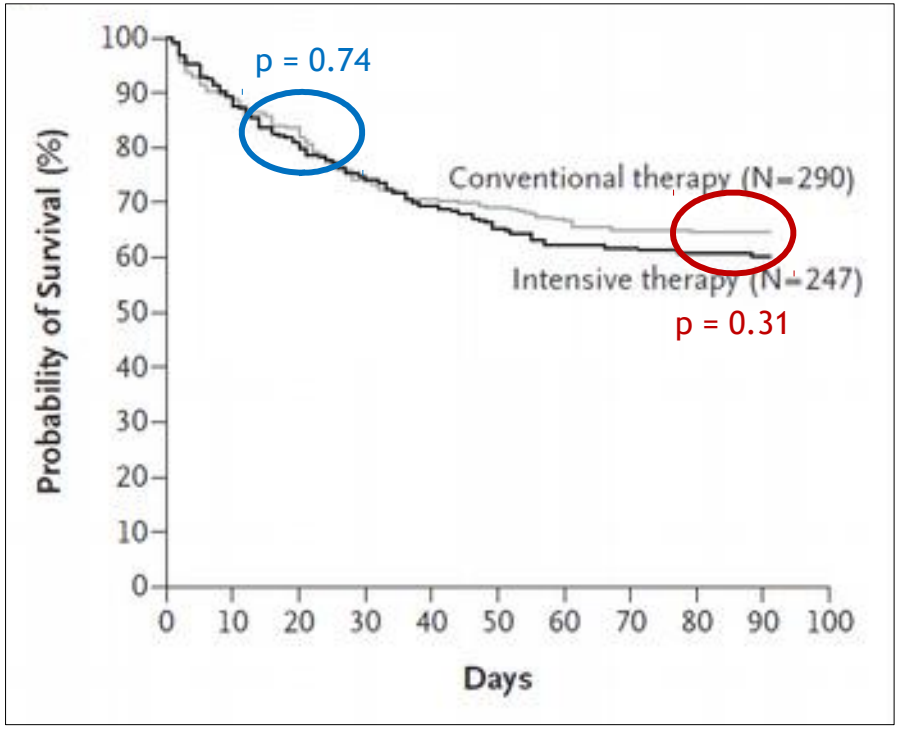
2008

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Intensive Insulin Therapy and Pentastarch Resuscitation in Severe Sepsis

Frank M. Brunkhorst, M.D., Christoph Engel, M.D., Frank Bloos, M.D., Ph.D., Andreas Meier-Hellmann, M.D., Max Ragaller, M.D., Norbert Weiler, M.D., Onnen Moerer, M.D., Matthias Gruendling, M.D., Michael Oppert, M.D., Stefan Grond, M.D., Derk Olthoff, M.D., Ulrich Jaschinski, M.D., Stefan John, M.D., Rolf Rossaint, M.D., Tobias Welte, M.D., Martin Schaefer, M.D., Peter Kern, M.D., Evelyn Kuhnt, M.Sc., Michael Kiehntopf, M.D., Christiane Hartog, M.D., Charles Natanson, M.D., Markus Loeffler, M.D., Ph.D., and Konrad Reinhart, M.D., for the German Competence Network Sepsis (SepNet)



2008

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Intensive Insulin Therapy and Pentastarch Resuscitation in Severe Sepsis

Frank M. Brunkhorst, M.D., Christoph Engel, M.D., Frank Bloos, M.D., Ph.D., Andreas Meier-Hellmann, M.D., Max Ragaller, M.D., Norbert Weiler, M.D., Onnen Moerer, M.D., Matthias Gruendling, M.D., Michael Oppert, M.D., Stefan Grond, M.D., Derk Olthoff, M.D., Ulrich Jaschinski, M.D., Stefan John, M.D., Rolf Rossaint, M.D., Tobias Welte, M.D., Martin Schaefer, M.D., Peter Kern, M.D., Evelyn Kuhnt, M.Sc., Michael Kiehntopf, M.D., Christiane Hartog, M.D., Charles Natanson, M.D., Markus Loeffler, M.D., Ph.D., and Konrad Reinhart, M.D., for the German Competence Network Sepsis (SepNet)

Table 3. Adverse and Serious Adverse Events.*

Variable	Insulin Therapy			Fluid Resuscitation		
	Conventional (N=253)	Intensive (N=247)	P Value†	Ringer's Lactate (N=275)	HES (N=262)	P Value‡
Adverse event						
Patients with at least one adverse event			<0.001			0.81
No. of patients	80	25	55	40	40	
Percent (95% CI)	14.9 (11.9–17.9)	8.6 (5.4–11.9)	22.3 (17.1–27.5)	14.5 (10.4–18.7)	15.3 (10.9–19.6)	
Hypoglycemia (≤40 mg/dl)			<0.001			0.85
No. of patients	54	12	42	27	27	
Percent (95% CI)	10.1 (7.5–12.6)	4.1 (1.9–6.4)	17.0 (12.3–21.7)	9.8 (6.3–13.3)	10.3 (6.6–14.0)	
Bleeding			0.30			0.45
No. of patients	23	10	13	10	13	
Percent (95% CI)	4.3 (2.6–6.0)	3.4 (1.4–5.6)	5.3 (2.5–8.1)	3.6 (1.3–5.9)	5.0 (2.3–7.6)	
Other§						0.11
No. of patients	10	5	5	8	2	
Percent (95% CI)	1.9 (0.7–3.0)	1.7 (0.2–3.2)	2.0 (0.3–3.8)	2.9 (0.9–4.9)	0.8 (0–1.8)	
Serious adverse event						
Patients with at least one serious adverse event			0.01			0.63

Počet pacientů s ≥1 nežádoucím účinkem
9 vs. 22 (%)

Počet pacientů s hypoglykémií <40 mg/dl
4 vs. 17 (%)

2009

Intensive Care Med (2009) 35:1738–1748
DOI 10.1007/s00134-009-1585-2

ORIGINAL

Jean-Charles Preiser
Philippe Devos
Sergio Ruiz-Santana
Christian Mélot
Djillali Annane
Johan Groeneveld
Gaetano Iapichino
Xavier Leverve
Gérard Nitenberg
Pierre Singer
Jan Wernerman
Michael Joannidis
Adela Stecher
René Chioléro

A prospective randomised multi-centre controlled trial on tight glucose control by intensive insulin therapy in adult intensive care units: the Glucontrol study

Výskyt hypoglykémie
3 vs. 9 (%)

Table 3 Outcome data, treatment-related variables, nutritional management and therapeutic variables glucose control

	Group 1 BG target 7.8–10.0 mmol/L $N = 542$	Group 2 BG target 4.4–6.1 mmol/L $N = 536$	p Value
Glucose control and insulin therapy			
Blood glucose concentrations calculated from all readings (mmol/L) [median (IQR)]	8.0 (7.1–9.0)	6.5 (6.0–7.2)	<0.0001
Blood glucose concentrations calculated from morning readings (mmol/L) [median (IQR)]	7.7 (6.7–8.8)	6.1 (5.5–6.8)	<0.0001
Rate of hypoglycaemia calculated from BG % (n)	2.7 (13)	8.7 (44)	<0.0001
Estimated duration of hypoglycaemia (min) in patients presenting hypoglycaemic episode [median (IQR)]	59 (37–76)	52 (13–135)	0.887
Proportion of time in range			
(% of all BG readings)	34.7 (164)	42.8 (196)	0.0118
(% of morning BG)	39.5 (187)	45.1 (207)	0.0856
p value (difference between all readings and morning BG)	NS	NS	
Median of the proportion of time in range (%) (IQR)	34.3 (18.5–50.1)	39.3 (26.2–53.6)	
Proportion of time below the range			
(% of all BG readings)	50.3 (238)	5.9 (27)	<0.0001
(% of morning BG)	51.2 (242)	5.2 (24)	
p value (difference between all readings and morning BG)	NS	NS	<0.0001
Median of the proportion of time below range (%) (IQR)	44.7 (24.3–75.8)	5.1 (1.1–9.2)	
Proportion of time above the range			
(% of all BG readings)	14.9 (71)	51.3 (236)	<0.0001
(% of morning BG)	9.3 (44)	49.7 (228)	
p value (difference between all readings and morning BG)	0.0072	NS	<0.0001
Median of the proportion of time above range (%) (IQR)	7.6 (0.0–25.3)	52.6 (39.2–67.4)	
AUChigh (hour mmol L^{-1}) [median(IQR)]	4.1 (0–40.2)	79.3 (25.9–181.1)	<0.0001
AUClow (hour mmol L^{-1}) [median(IQR)]	42.3 (12.8–125.9)	2.1 (0.2–6.1)	<0.0001
Hyperglycaemic index (mmol L^{-1}) [median(IQR)]	0.06 (0.00–0.33)	0.78 (0.39–1.39)	<0.0001
Hypoglycaemic index (mmol L^{-1}) [median (IQR)]	0.44 (0.22–0.94)	0.33 (0.03–0.85)	<0.0001

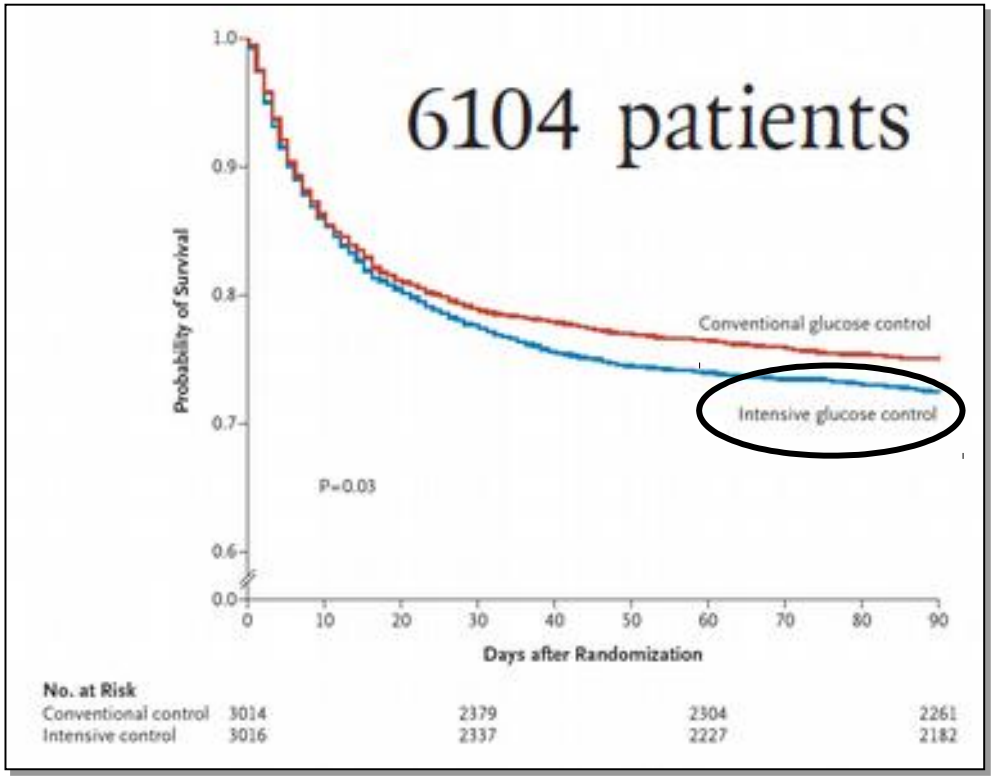
2009

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MARCH 26, 2009 VOL. 360 NO. 13

Intensive versus Conventional Glucose Control in Critically Ill Patients

The NICE-SUGAR Study Investigators*



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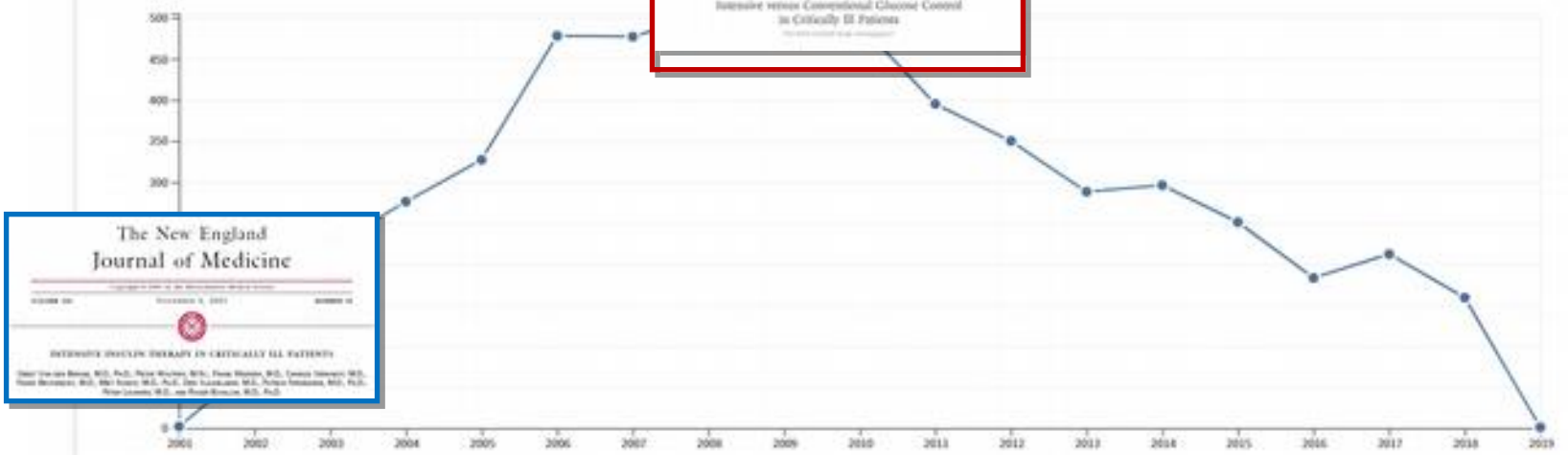
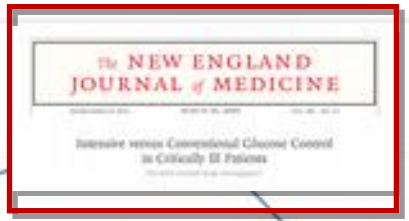
Sum of Times Cited per Year



The New England Journal of Medicine

INTENSIVE INSULIN THERAPY IN CRITICALLY ILL PATIENTS


The NEW ENGLAND JOURNAL of MEDICINE

Intensive versus Conventional Glucose Control in Critically Ill Patients

Intensive Care Med (2017) 43:304–377
DOI 10.1007/s00134-017-4683-6

CONFERENCE REPORTS AND EXPERT PANEL

Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016

Andrew Rhodes[1*], Laura E. Evans[2], Waleed Alhazzani[3], Mitchell M. Levy[4], Massimo Antonelli[5], Ricard Ferrer[6], Anand Kumar[7], Jonathan E. Sevransky[8], Charles L. Sprung[9], Mark E. Nunnally[2], Bram Rochwerg[3], Gordon D. Rubenfeld[10], Derek C. Angus[11], Djillali Annane[12], Richard J. Beale[13], Geoffrey J. Bellinghan[14], Gordon R. Bernard[15], Jean-Daniel Chiche[16], Craig Coopersmith[8], Daniel P. De Backer[17], Craig J. French[18], Seitaro Fujishima[19], Herwig Gerlach[20], Jorge Luis Hidalgo[21], Steven M. Hollenberg[22], Alan E. Jones[23], Dilip R. Karnad[24], Ruth M. Kleinpell[25], Younsuk Koh[26], Thiago Costa Lisboa[27], Flavia R. Machado[28], John J. Marini[29], John C. Marshall[30], John E. Mazuski[31], Lauralyn A. McIntyre[32], Anthony S. McLean[33], Sangeeta Mehta[34], Rui P. Moreno[35], John Myburgh[36], Paolo Navalesi[37], Osamu Nishida[38], Tiffany M. Osborn[31], Anders Perner[39], Colleen M. Plunkett[25], Marco Ranieri[40], Christa A. Schorr[22], Maureen A. Seckel[41], Christopher W. Seymour[42], Lisa Shieh[43], Khalid A. Shukri[44], Steven Q. Simpson[45], Mervyn Singer[46], B. Taylor Thompson[47], Sean R. Townsend[48], Thomas Van der Poll[49], Jean-Louis Vincent[50], W. Joost Wiersinga[49], Janice L. Zimmerman[51] and R. Phillip Dellinger[22]

CONFERENCE REPORTS AND EXPERT PANEL

Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016

0. GLUCOSE CONTROL

zahájit při >10 mmol/l
a držet <10 mmo/l

1. We recommend a protocolized approach to blood glucose management in ICU patients with sepsis, commencing insulin dosing when two consecutive blood glucose levels are >180 mg/dL. This approach should target an upper blood glucose level ≤180 mg/dL rather than an upper target blood glucose level ≤110 mg/dL (strong recommendation, high quality of evidence).

Several medical organizations, including the American Association of Clinical Endocrinologists, American Diabetes Association, American Heart Association, American College of Physicians, and Society of Critical Care Medicine, have published consensus statements for glycemic control of hospitalized patients [463, 465]. These statements usually targeted glucose levels between 140 and 180 mg/dL. Because there is no evidence that targets between 140 and 180 mg/dL are different from targets of 110–140 mg/dL, the present recommendations use an upper target blood glucose ≤180 mg/dL without a lower target other than hypoglycemia. Stricter ranges, such as 110–140 mg/dL, may be appropriate for selected patients if this can be achieved without significant hypoglycemia [463, 465].

Protože není evidence, že by rozmezí 7.8-10 bylo lepší než 6.1-7.8...

463. American Diabetes Association (2014) Standards of medical care in diabetes—2014. Diabetes Care 37(Suppl 1):S14–S80
465. Qaseem A, Chou R, Humphrey LL (2014) Shekelle P; Clinical Guidelines Committee of the American College of Physicians. Inpatient glycemic control: best practice advice from the Clinical Guidelines Committee of the American College of Physicians. Am J Med Qual 29(2):95–98

mmol/l		mg/dl
4.4	=	80
6.1	=	110
7.8	=	140
8.3	=	150
10	≈	180

	Před NICE-SUGAR	Po NICE-SUGAR
Surviving Sepsis Campaign	4.4-6.1 (<8.3)	<10
Society of Critical Care Medicine		začít při 8.3
American Diabetes Association	co nejblíže 6.1	7.8-10
American College of Endocrinology	<6.1	7.8-10
American College of Physicians	<10	7.8-11
European Society of Intensive Care Medicine	4.4-6.1	4.4-7.8 (??)

Dellinger *et al*: *Crit Care Med* 2013, 41(2):580-637.
Jacobi *et al*: *Crit Care Med* 2012, 40(12):3251-3276.
Krinsley JS, *et al*. *Crit Care* 2013, 17(2):R37.
ADA. *Diabetes Care* 2013, 36 Suppl 1:S11-66.
Handelsman Y *et al*: *Endocr Pract* 2015, 21 Suppl 1:1-87.
Standards of medical care in diabetes—2014. American Diabetes Association. Diabetes Care 37(Suppl 1):S14–S80

Můžete s tím nesouhlasit,
dá se o tom pochybovat,
ale to je jediné, co se s tím dá dělat…


ONEMAN
SHOW
CREW
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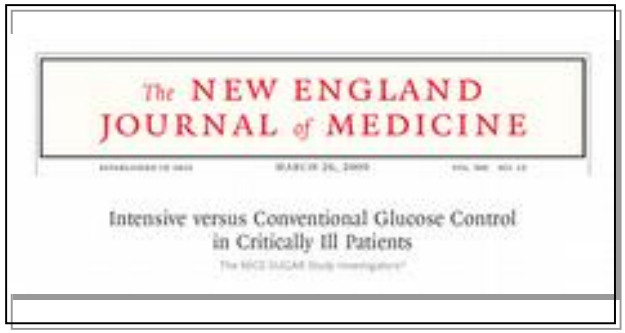
SHOW
CREW


1 / 10



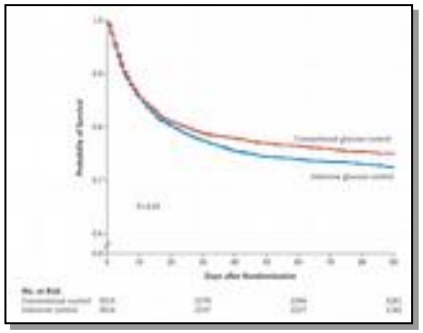
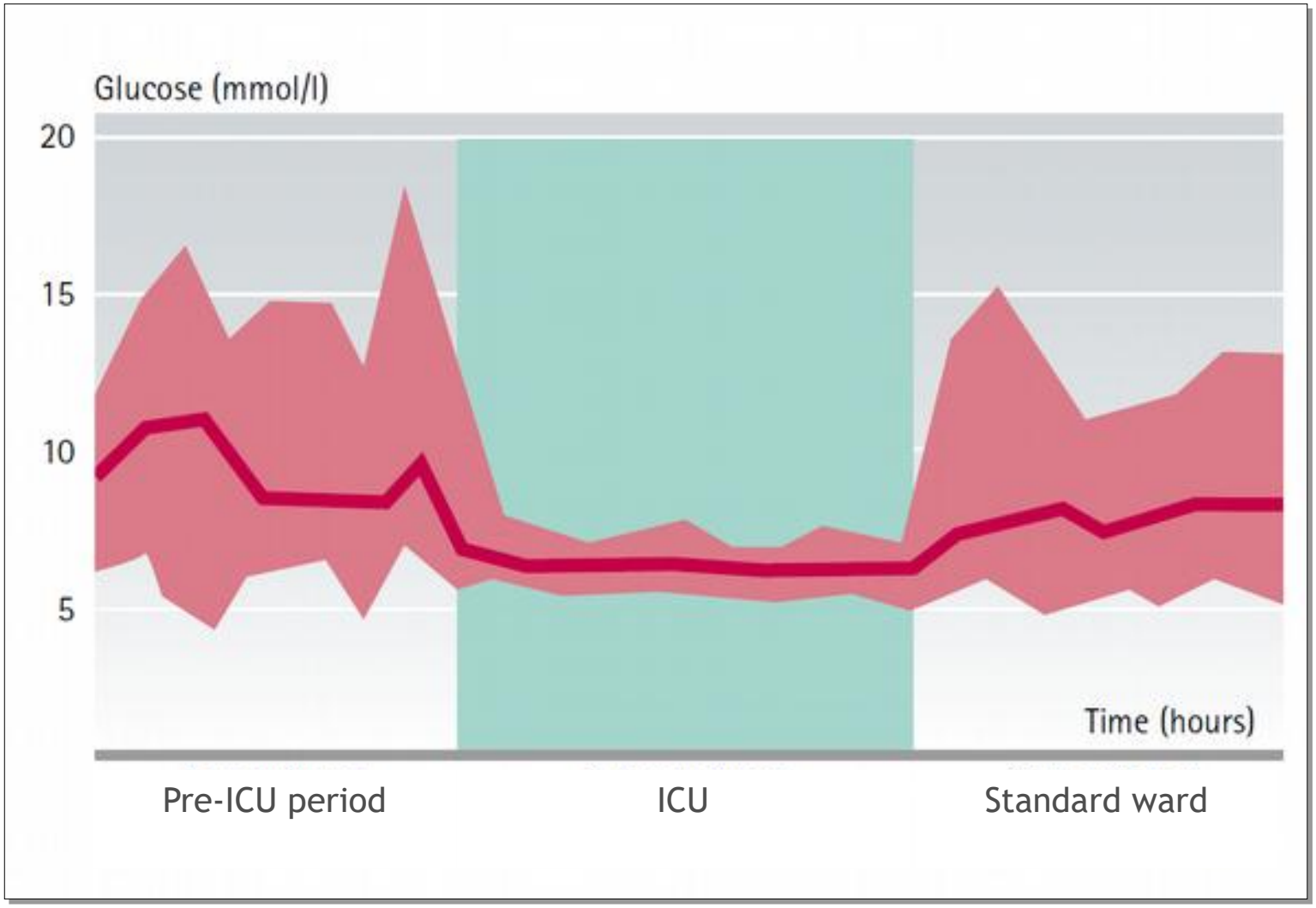


Table 3. Outcomes and Adverse Events.*

Outcome Measure	Intensive Glucose Control	Conventional Glucose Control	Odds Ratio or Absolute Difference (95% CI)†	Statistical Test	P Value
Death — no. of patients/total no. (%)				Logistic regression	
At day 90	829/3010 (27.5)	751/3012 (24.9)	1.14 (1.02 to 1.28)		0.02
At day 28	670/3010 (22.3)	627/3012 (20.8)	1.09 (0.96 to 1.23)		0.17
Days in ICU — median (IQR)	6 (2 to 11)	6 (2 to 11)	0	Log-rank test	0.84
Days in hospital — median (IQR)	17 (8 to 35)	17 (8 to 35)	0	Log-rank test	0.86
Mechanical ventilation — no. of patients/total no. (%)	2894/3014 (96.0)	2872/3014 (95.3)	0.7 (−0.3 to 1.76)	Pearson's test	0.17
Days of mechanical ventilation	6.6±6.6	6.6±6.5	0	Wilcoxon rank-sum test	0.56
Renal-replacement therapy — no. of patients/total no. (%)	465/3014 (15.4)	438/3014 (14.5)	0.9 (−0.9 to 2.7)	Pearson's test	0.34
Days of renal-replacement therapy	0.8±2.6	0.8±2.8	0	Wilcoxon rank-sum test	0.39

N Engl J Med. 2009 Mar 26;360(13):1283-97



Adaptováno z Amrein K, Glucose Management; Berlin 2011)

N ENGL J MED 367;12 NEJM.ORG SEPTEMBER 20, 2012

ORIGINAL ARTICLE

Hypoglycemia and Risk of Death in Critically Ill Patients

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Sep 23 2012

Intensive glucose control probably kills, says NICE-SUGAR post-hoc (NEJM)

Critical Care, GI and Nutrition, Randomized Controlled Trials Add comments

sociation exhibits a dose–response relationship and is strongest for death from distributive shock. However, these data cannot prove a causal relationship. (Funded by the Australian National Health and Medical Research Council and others; NICE-SUGAR ClinicalTrials.gov number, NCT00220987.)

Kardiochirurgie (2007-8)

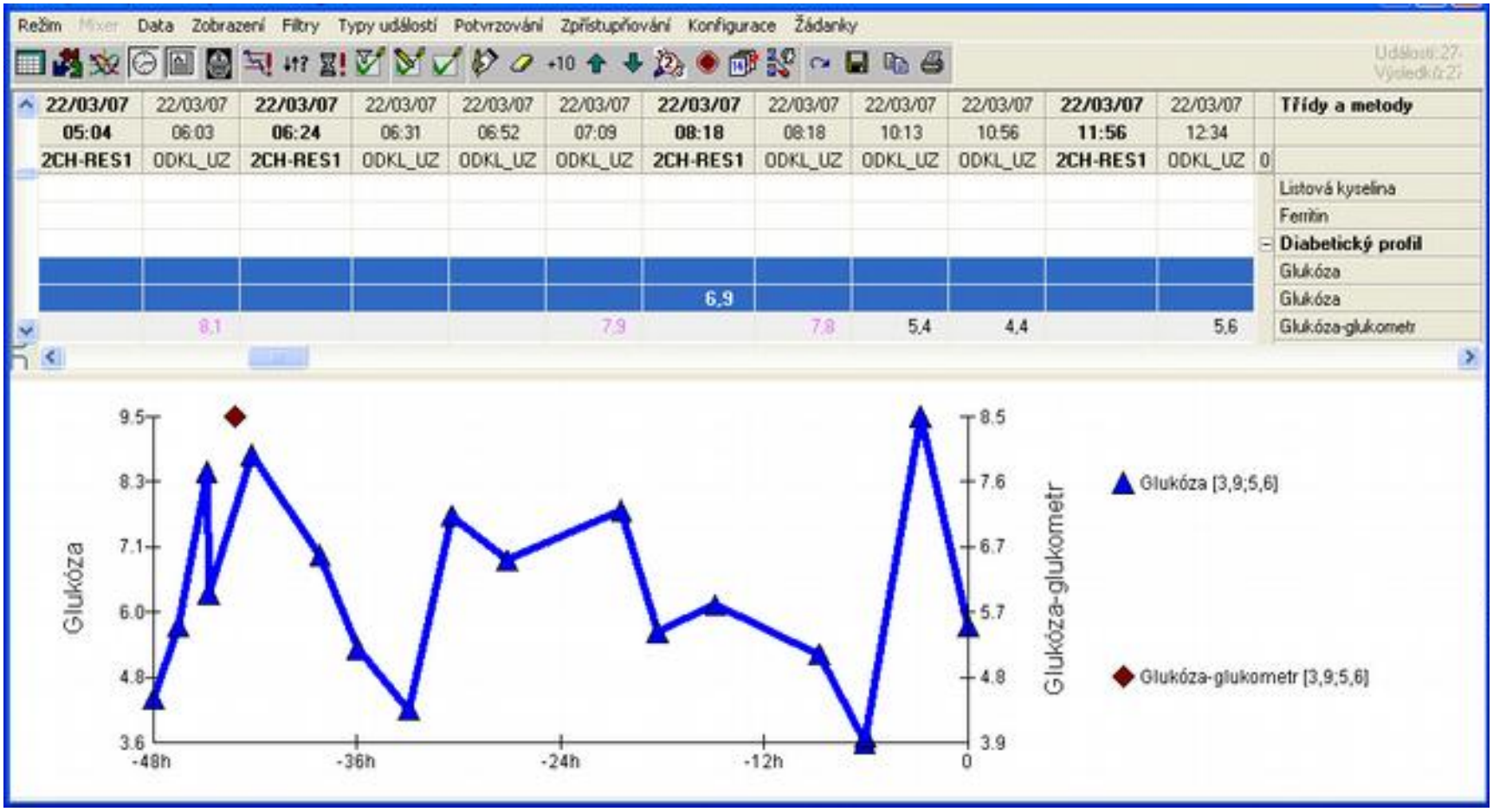
Výskyt hypoglykémie u 985 nonDM pacientů (%)

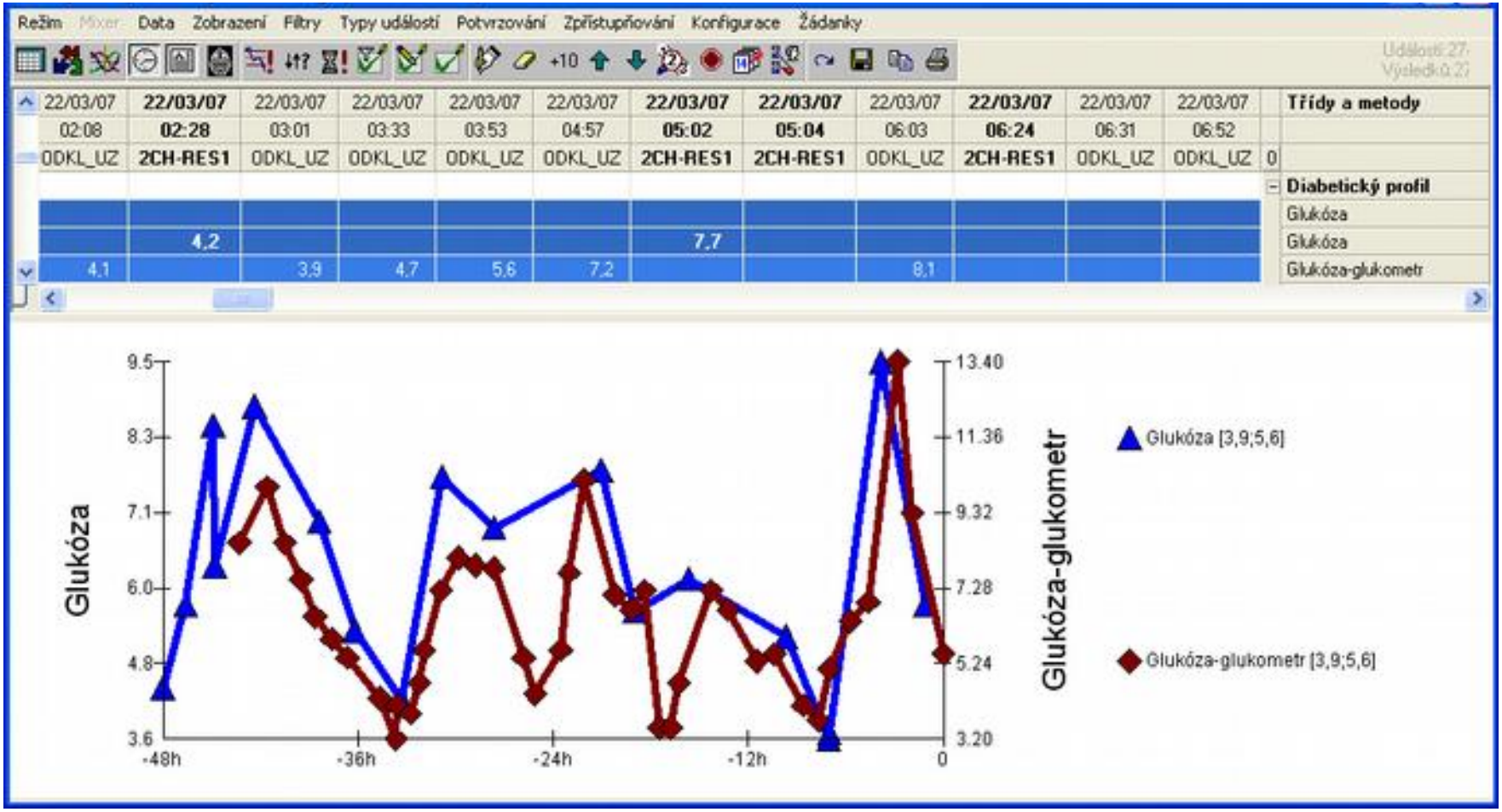
Pooperační JIP		
hypoglykémie <4.4	hypoglykémie <3.3	hypoglykémie <2.2
10,5	1,4	0,02

Standardní oddělení		
hypoglykémie <4.4	hypoglykémie <3.3	hypoglykémie <2.2
3,9	2,3	0,1

(hladiny glykémie v mmol/l)

Bláha 2010, GAUK 44407


Režim
Data
Zobrazení
Filtry
Typy událostí
Potvrzování
Zpřístupňování
Konfigurace
Žádanky
Třídy a metody
Listová kyselina
Ferritin
Diabetický profil
Glukóza
Glukóza
Glukóza-glukometr
6,9
Glukóza
Glukóza-glukometr
Glukóza [3,9;5,6]
Glukóza-glukometr [3,9;5,6]
-48h
-36h
-24h
-12h
0


Režim
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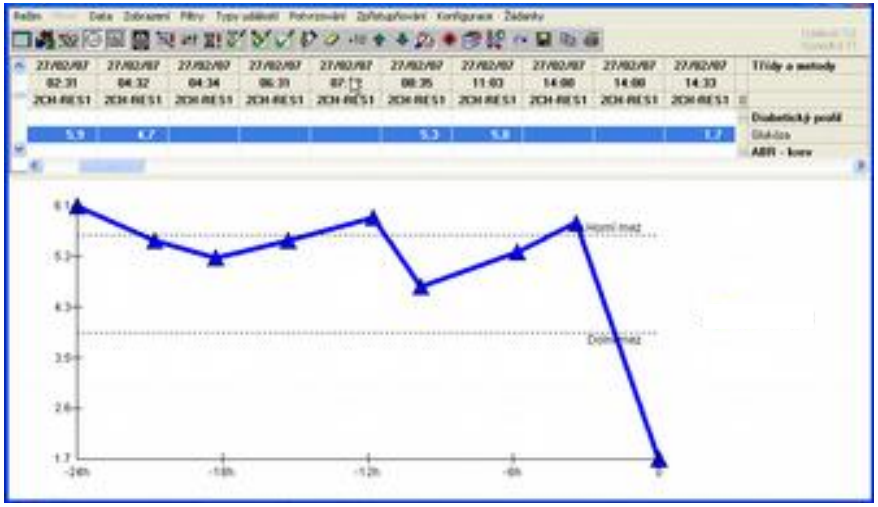
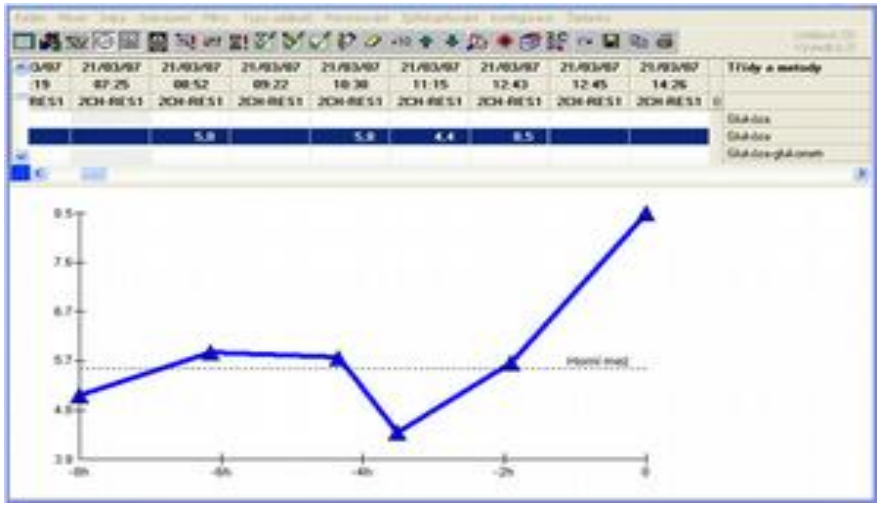
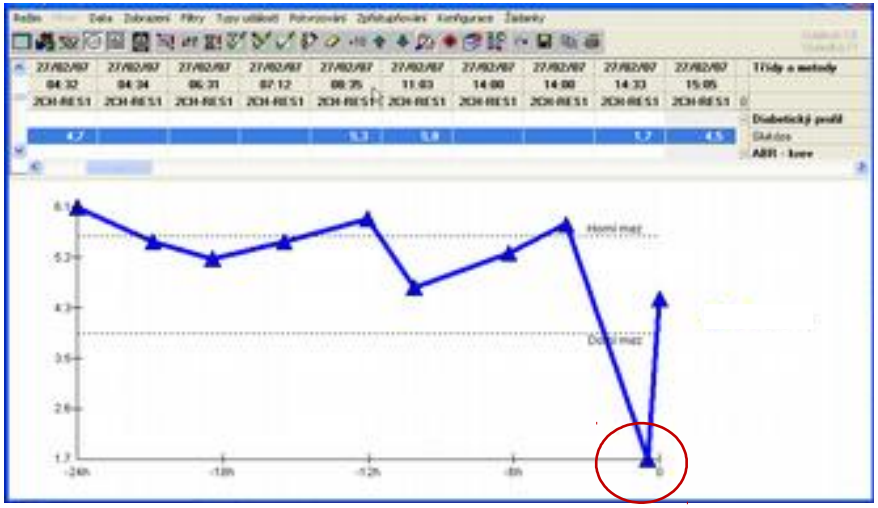
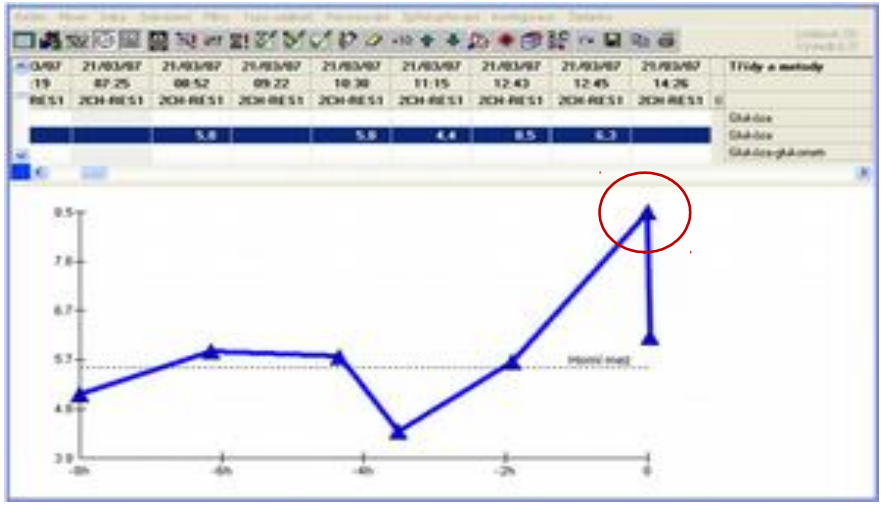
Zobrazení
Filtry
Typy událostí
Potvrzování
Zpřístupňování
Konfigurace
Žádanky
+10
Události: 27
Výsledků: 27
22/03/07 02:08 ODKL_UZ
22/03/07 02:28 2CH-RES1
22/03/07 03:01 ODKL_UZ
22/03/07 03:33 ODKL_UZ
22/03/07 03:53 ODKL_UZ
22/03/07 04:57 ODKL_UZ
22/03/07 05:02 2CH-RES1
22/03/07 05:04 2CH-RES1
22/03/07 06:03 ODKL_UZ
22/03/07 06:24 2CH-RES1
22/03/07 06:31 ODKL_UZ
22/03/07 06:52 ODKL_UZ
Třídy a metody
Diabetický profil
Glukóza
Glukóza
Glukóza-glukometr
4,2
7,7
4,1
3,9
4,7
5,6
7,2
8,1
Glukóza
Glukóza-glukometr
9.5
8.3
7.1
6.0
4.8
3.6
13.40
11.36
9.32
7.28
5.24
3.20
-48h
-36h
-24h
-12h
0
Glukóza [3,9;5,6]
Glukóza-glukometr [3,9;5,6]







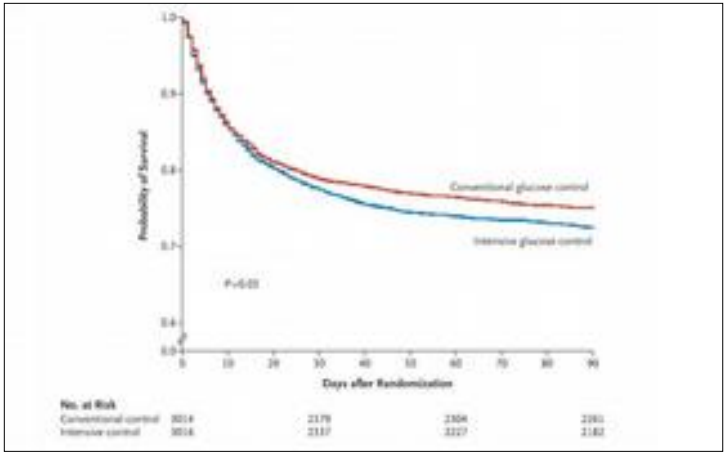


The NEW ENGLAND JOURNAL of MEDICINE

MARCH 26, 2009

Intensive versus Conventional Glucose Control in Critically Ill Patients

The NICE-SUGAR Study Investigators*



173 of all 288 episodes (60.1%) were confirmed by a laboratory measurement, 112 (38.9%) were unconfirmed bedside readings, and 3 (1.0%) were of unknown confirmation status.

N Engl J Med. 2009 Mar 26;360(13):1283-97

ODBĚR KREVNÍHO VZORKU

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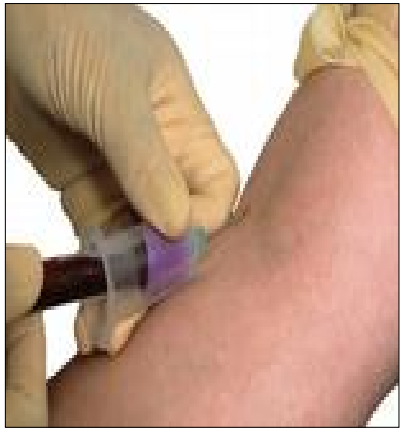

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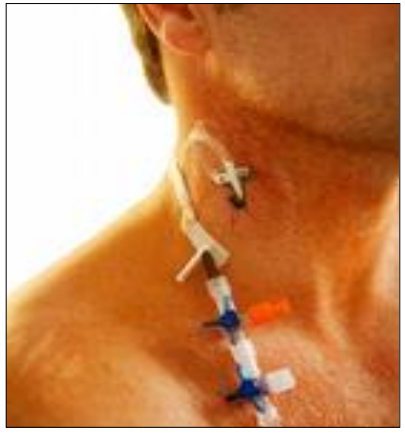

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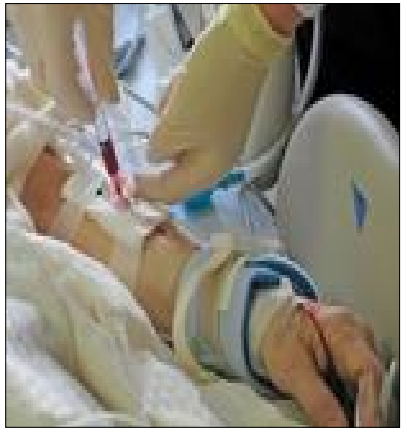
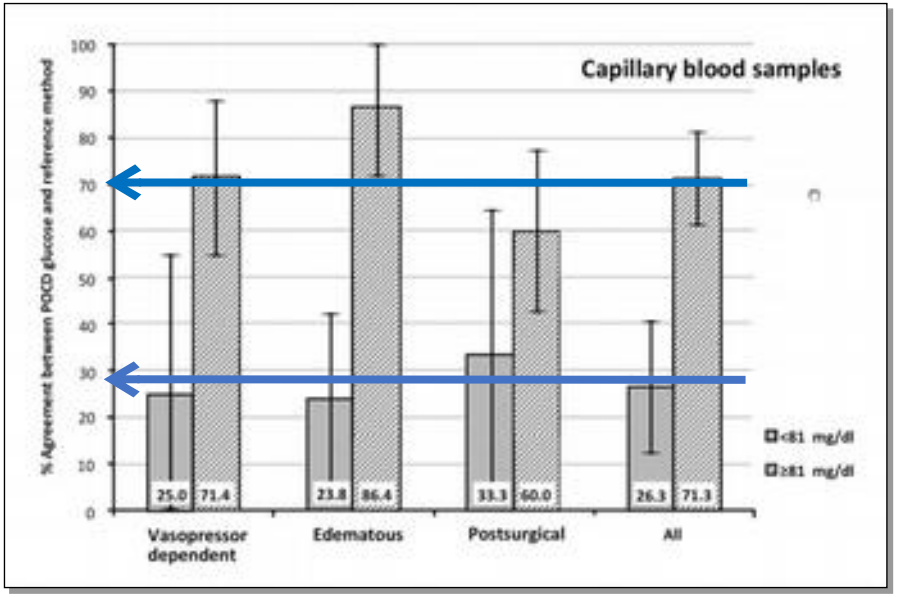
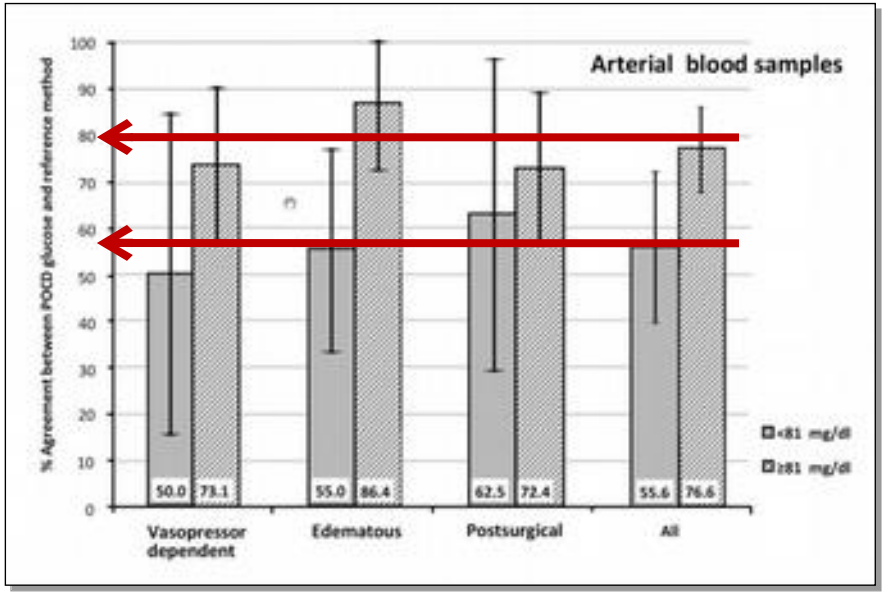


Fekih Hassen M. Diabetes Res Clin Pract. 2010 Jan;87(1):87-91
Critchell CD et al. Intensive Care Med. 2007 Dec;33(12):2079-84
Hassen FM. Diabetes Res Clin Pract. 2010 Jan;87(1):87-91





Point-of-care glucose monitoring devices (POCGMDs) glucose measurement agreement with reference method during hypoglycemia versus nonhypoglycemia in critically ill patients. The POCGMD glucose measurement were said to agree with the reference method (CLD) if both measurements resulted in a similar clinical intervention.

The original data source: Kanji S, et al. Reliability of point-of-care testing for glucose measurement in critically ill adults. Crit Care Med. 2005;33(12):2778–2785.

Rebel A et al. Accuracy of point-of-care glucose measurements. J Diabetes Sci Technol. 2012 March; 6(2): 396–411

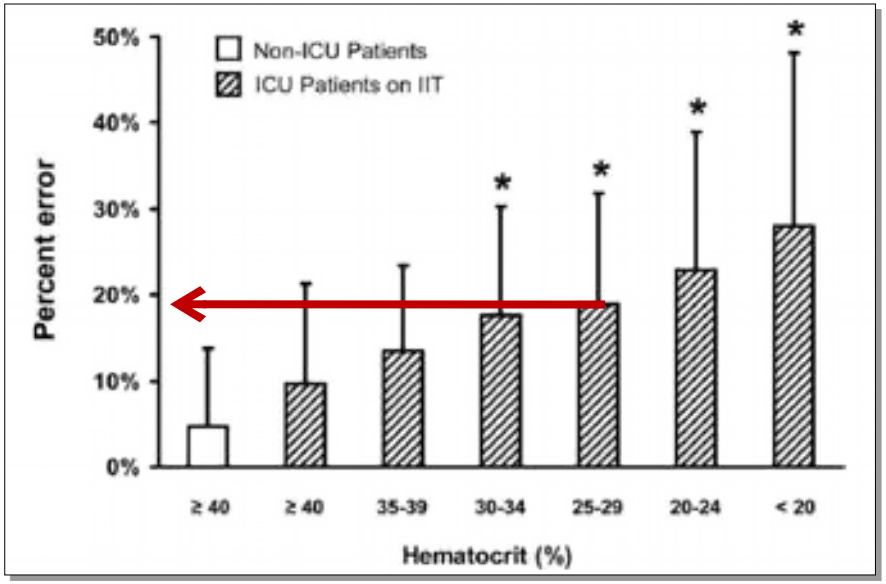


Figure 1. Percent error in glucometer measurements (reference = laboratory glucose) inversely correlated with degree of anemia in intensive care unit (*ICU*) patients; the lowest hematocrit group, significantly different from that of normal hematocrit in non-ICU patient samples collected during same time period ($p < .001$). *IIT*, intensive insulin therapy.

Pidcoke et al. Crit Care Med 2010; 38:471– 476

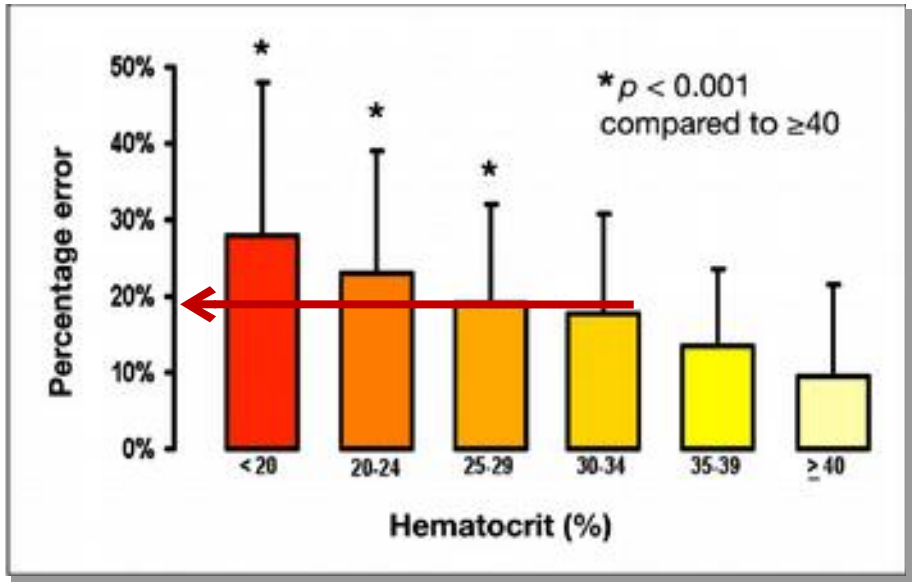


Figure 3. Glucometer error increases in a linearly as HCT decreases.

Mann AE et al. J Diabetes Sci Technol 2009;3(6):1319-1329

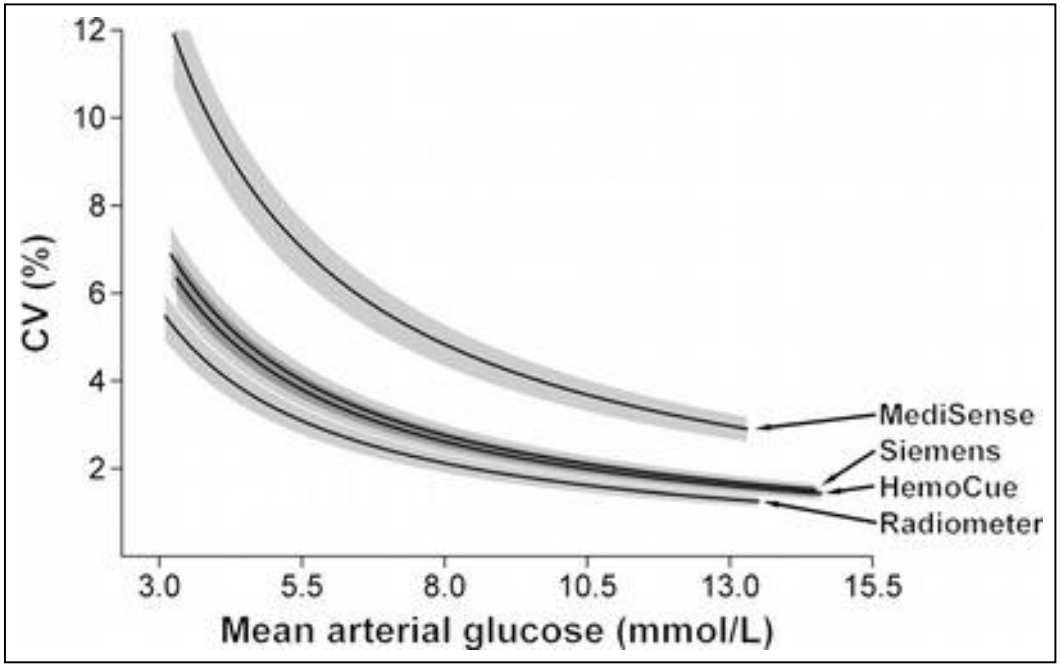


Figure 1
Arterial glucose concentration imprecision profiles for MediSense PCχ, Siemens ADVIA, HemoCue DM and Radiometer 700 instruments. Shaded areas represent approximate 95% confidence intervals

Watkinson PJ et al. Ann Clin Biochem. 2012 Mar;49(Pt 2):144-51

Finfer et al. Critical Care 2013, 17:229
http://ccforum.com/content/17/3/229

CRITICAL CARE

REVIEW

Clinical review: Consensus recommendations on measurement of blood glucose and reporting glycemic control in critically ill adults

Simon Finfer[1], Jan Wernerman[2], Jean-Charles Preiser*[3], Tony Cass[4], Thomas Desaive[5], Roman Hovorka[6], Jeffrey I Joseph[7], Mikhail Kosiborod[8], James Krinsley[9], Iain Mackenzie[10], Dieter Mesotten[11], Marcus J Schultz[12], Mitchell G Scott[13], Robbert Slingerland[14], Greet Van den Berghe[11] and Tom Van Herpe[11,15]

Appropriate standards for intermittent measurement of blood glucose in the ICU

Blood sampling

1. Patients whose severity of illness justifies invasive vascular monitoring
   a. All blood samples should be drawn from an arterial line
   b. If an arterial line is temporarily or permanently unavailable, sample from a venous line
   c. Capillary (needle stick) samples are inaccurate and should not be used

Choice of blood glucose analyzer in clinical practice in critical care units

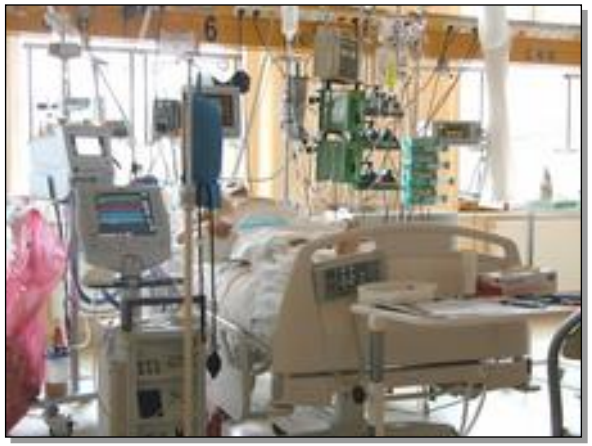
1. Patients whose severity of illness justifies invasive vascular monitoring
   a. Samples taken from arterial or central venous catheters should be analyzed in a central laboratory or blood gas analyzer; a blood gas analyzer should be the default analyzer, central laboratory measurements should only be used if results can be obtained without delay

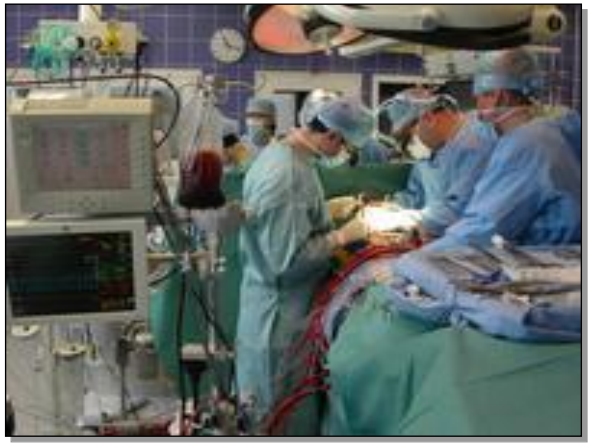
LIDSKÝ FAKTOR !

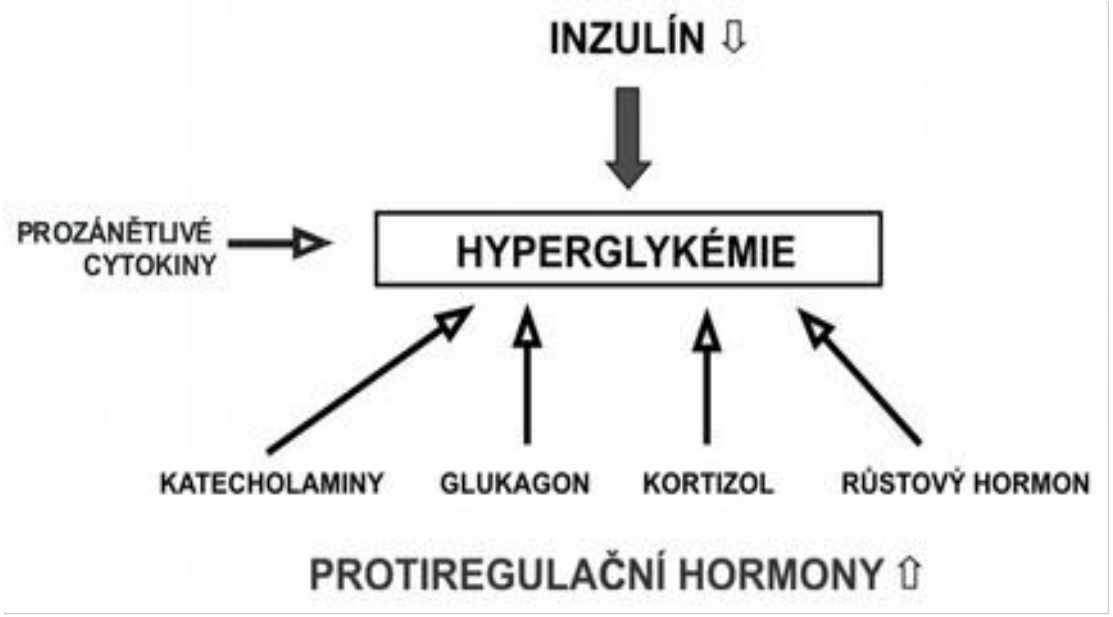
- chybný odběr krevního vzorku
- 5% všech hodnot glykémie zadaných do protokolu se neshoduje s naměřenými hodnotami

- nastavená rychlost inzulínu se od doporučení protokolu liší o 2% - 23%
- 83% ignorovaných doporučení bylo pro „obavy z hypoglykémie"
- riziko „nenastavení infusních pump" (např. při souběžné akutní situaci)

Campion TR et al. International Journal Of Medical Informatics 80 (2011) 863–871
Campion TR et al. J. Am. Med. Inform. Assoc. 18 (May (3)) (2011) 251–258.
Anger KE et al. Pharmacotherapy 26 (February (2)) (2006) 214–228.






INZULÍN ⇩
PROZÁNĚTLIVÉ CYTOKINY
HYPERGLYKÉMIE
KATECHOLAMINY
GLUKAGON
KORTIZOL
RŮSTOVÝ HORMON
PROTIREGULAČNÍ HORMONY ⇧

Marik and Bellomo *Critical Care* 2013, **17**:305
http://ccforum.com/content/17/2/305

CRITICAL CARE

VIEWPOINT

Stress hyperglycemia: an essential survival response!

Paul E Marik[1,*] and Rinaldo Bellomo[2]

NICE-SUGAR, a large randomized, multi-center trial performed in 6,104 ICU patients, demonstrated that intensive glucose control (81 to 108 mg/dl) increased mortality when compared to conventional glucose control [9].

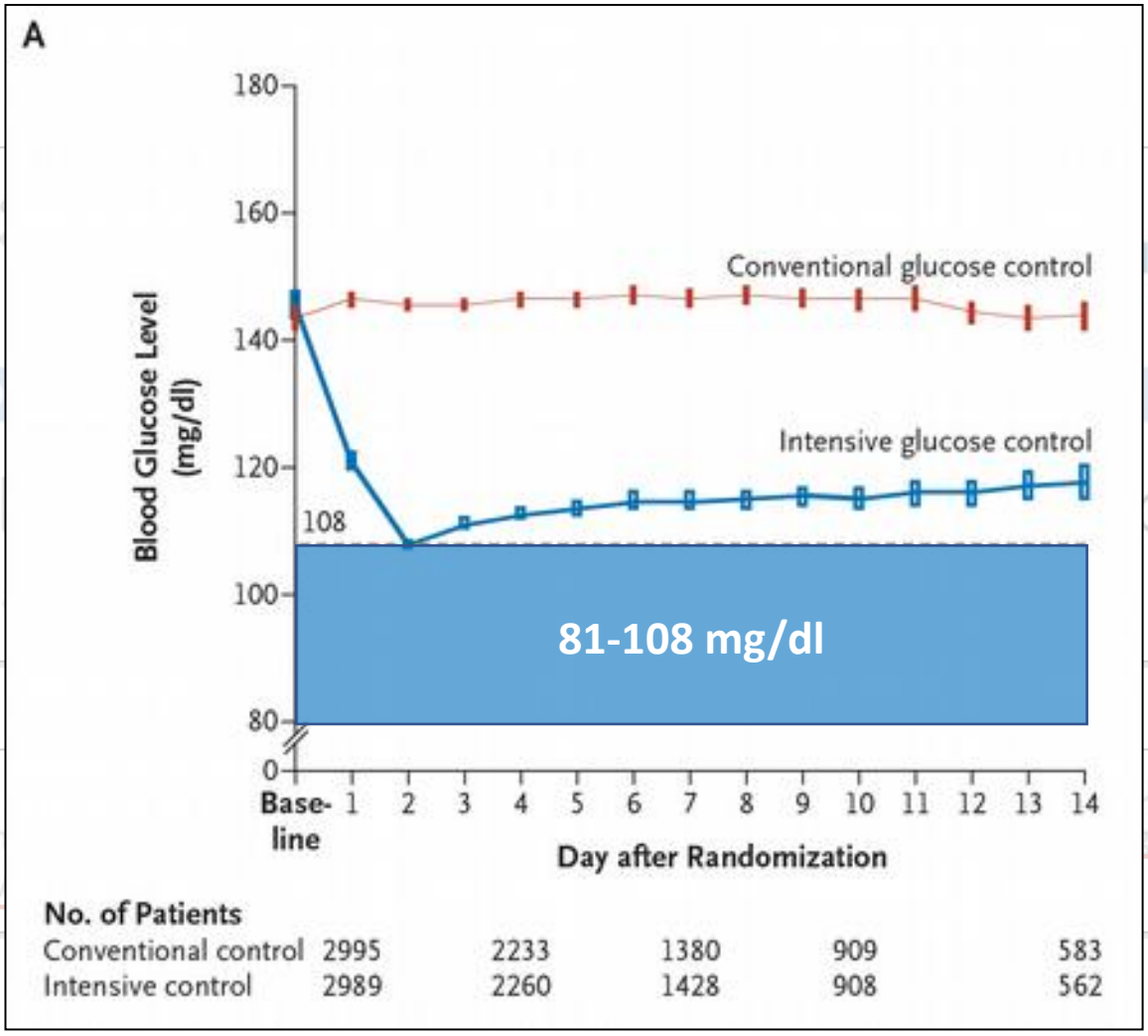
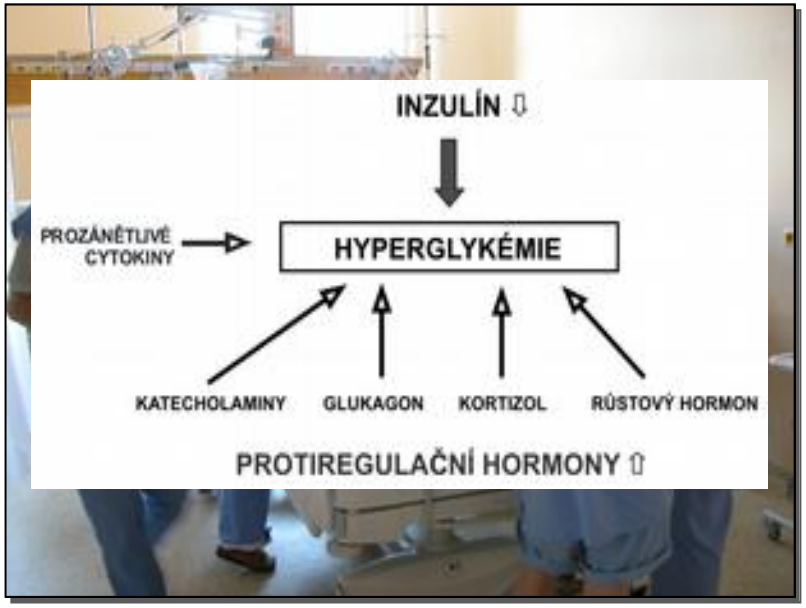


Figure 2. Data on Blood Glucose Level, According to Treatment Group.


172
EKG
J+60ms
68/ 45
54
ART1
PA3 100
CVP2 75
50
25
0
10/ 7
PAW 83
9
PA3
CVP2
-1
SPO2
31.1 31.5
T1 °C T2 °C
TPL1
25 µV/dB
SR 4
SQI 86
EMG SEF 10.9
31
BIS


INZULÍN ⇩
PROZÁNĚTLIVÉ CYTOKINY
HYPERGLYKÉMIE
KATECHOLAMINY
GLUKAGON
KORTIZOL
RŮSTOVÝ HORMON
PROTIREGULAČNÍ HORMONY ⇧


72
EKG
J+60ms
119/ 58
67
77
ART1
PA3 100
CVP2 75
50
25
0
32/ 22
PAW 83
24
PA3
CVP2
7
SPO2
100
37.1 37.5
T1 °C T2 °C
TPL1
25 µV/dB
SR 4
SQI 86
EMG SEF 10.9
91
BIS

HYPERGLYKÉMIE

- destabilizuje atheromové pláty a vede k akutnímu koronárnímu syndromu
- zvětšuje rozsah myokardiální nekrózy a redukuje koronární kolaterální průtok
- zhoršuje ischemicko-reperfúzní postižení

(Marfella, Diabetes Care 2000; Marfella, Diabetologia 2000; Kersten, Am J Physiol 1998; Kersten, Am J Physiol Heart Circ Physiol 2001; Verma, J Thorac Cardiovasc Surg 2002)

- zvyšuje riziko trombózy

(Sakamotol, Thromb Haemost 2000; Knobler, Thromb Res 1998; Gresele, J Am Coll Cardiol 2003)

- způsobuje endoteliální dysfunkci a aktivuje rozvoj systémového zánětu

(Beckman, Circulation 2001; Williams, Circulation 1998; Title, J Am Coll Cardiol 2000)

- snižuje cerebrální krevní průtok, zhoršuje ischemické poškození CNS

(Lin B, Acta Neuropathologica 1998; Gisselsson, J Cereb Blood Flow Metab 1999; Hoxworth, Brain Res 1999; Li, Stroke 2000; Capes, Stroke 2001)

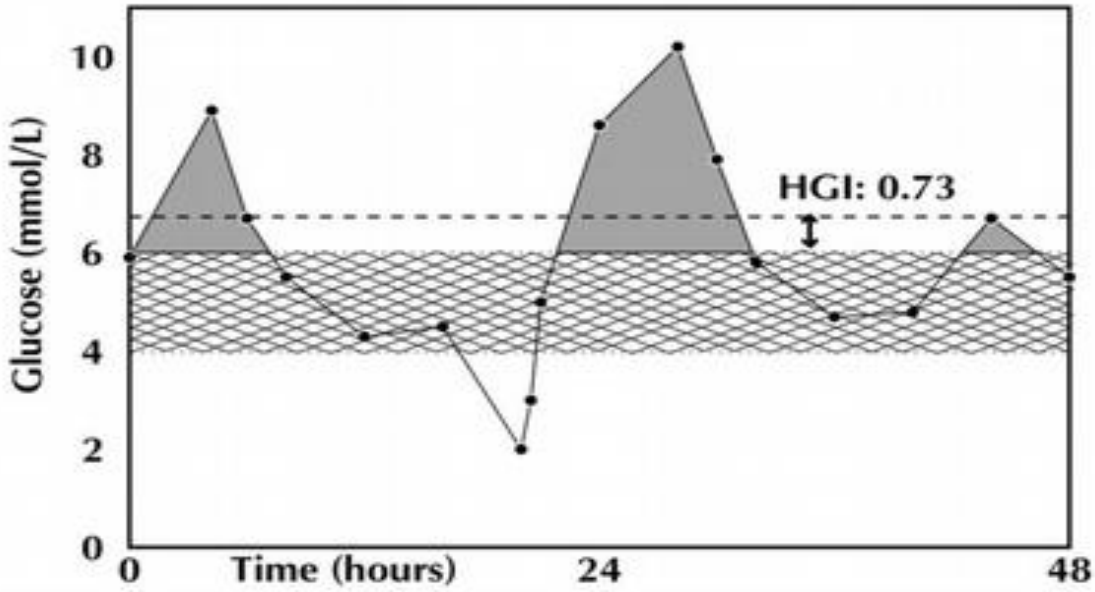
- zhoršuje rozsah renálního postižení u pacientů po kardiochirurgické operaci

(Meldrum, J Surg Res 1999; Van den Berghel, N Engl J Med 2001)

- zvyšuje počet infekčních pooperačních komplikací

(Butler, Pharmacotherapy 2005; Van den Berghe, N Engl J Med 2006; Van den Berghel, N Engl J Med 2001; Gale, Am Surg 2007)

HYPERGLYKÉMIE

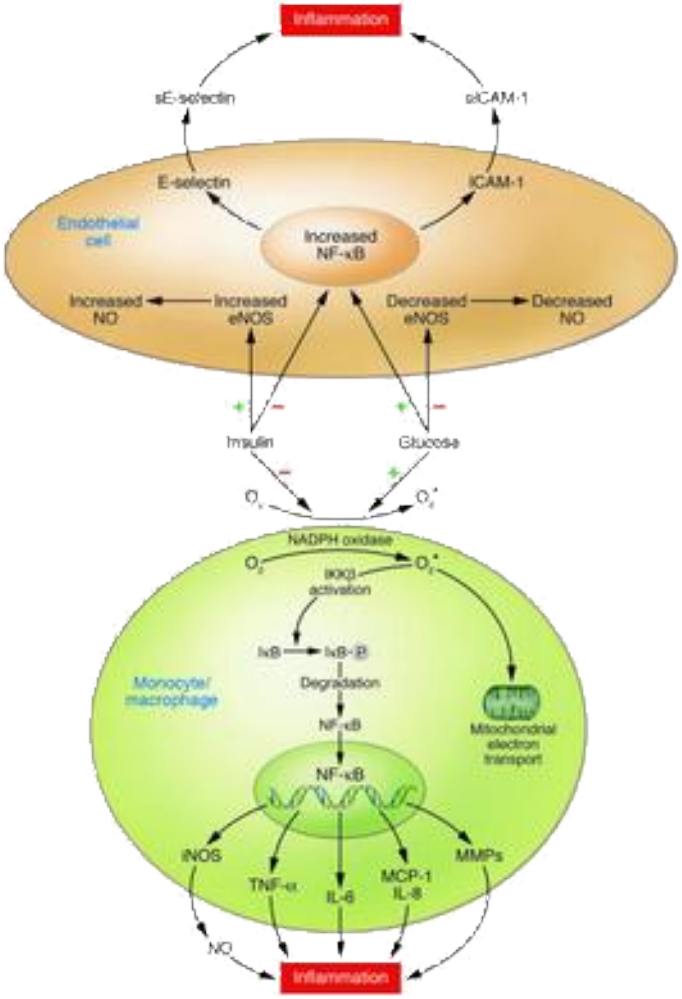


Characteristics for surviving and non-surviving patients and results of univariate analysis of glucose indices

Characteristic	Survivors	Nonsurvivors	*P*
Mean glucose (mmol/l)	6.9 (6.0–8.4)	7.7 (6.4–9.5)	<0.001
Morning glucose (mmol/l)	6.6 (5.9–7.9)	7.5 (6.2–8.8)	<0.001
Admission glucose (mmol/l)	7.2 (5.8–9.5)	7.9 (6.0–10.9)	0.07
Maximum glucose (mmol/l)	10.2 (8.0–14.2)	12.3 (9.5–16.4)	<0.001
HGI (mmol/l)	0.9 (0.3–2.1)	1.8 (0.7–3.4)	<0.001

Vogelzang et al. Critical Care 2004, 8(3):R122-R127

HYPERGLYKÉMIE



Dandona et al. J Clin Invest. 2005

- přímý toxický vliv glukózy
- cestou zvýšení intracelulárního oxidativního stresu při vyšší produkci mitochodriálních peroxidů

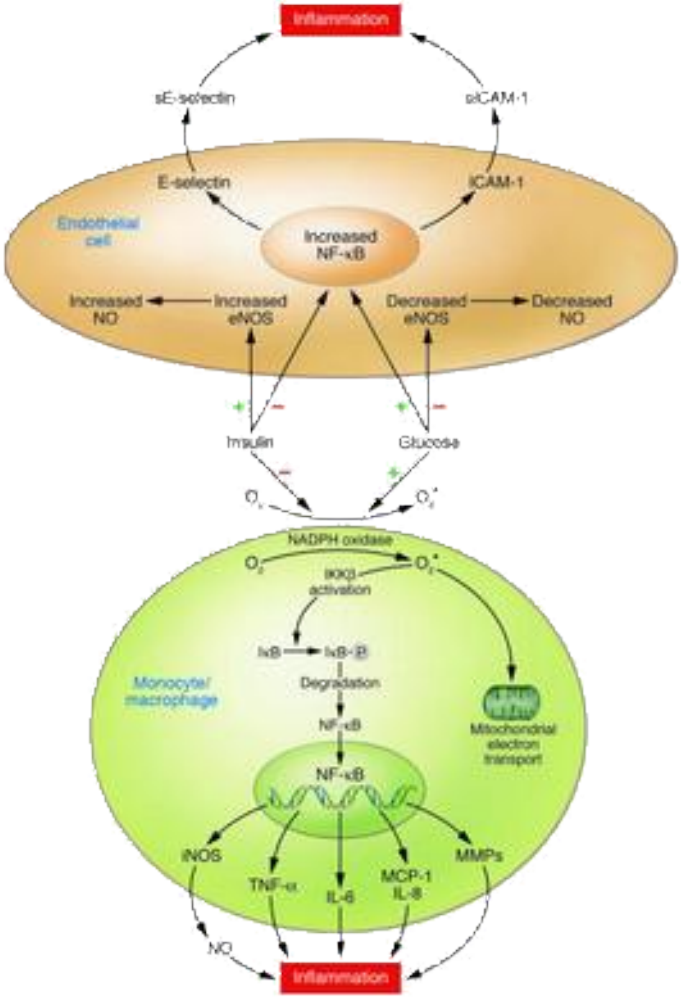
Quijano, Am J Physiol Heart Circ Physiol 2007; Vanhorebeek, Lancet 2005; Beal, JAMA 1994; Corstjens, Crit Care 2006; Henderson, CJEM 2006; Turina, Crit Care Med 2006

- větší poškození než vlastní hypoglykémie

způsobí rychlá reperfuze glukózou !

Suh SW. J. Clin. Invest 2007. 117(4):910-918

HYPERGLYKÉMIE



Dandona et al. J Clin Invest. 2005

HYPEROXÉMIE

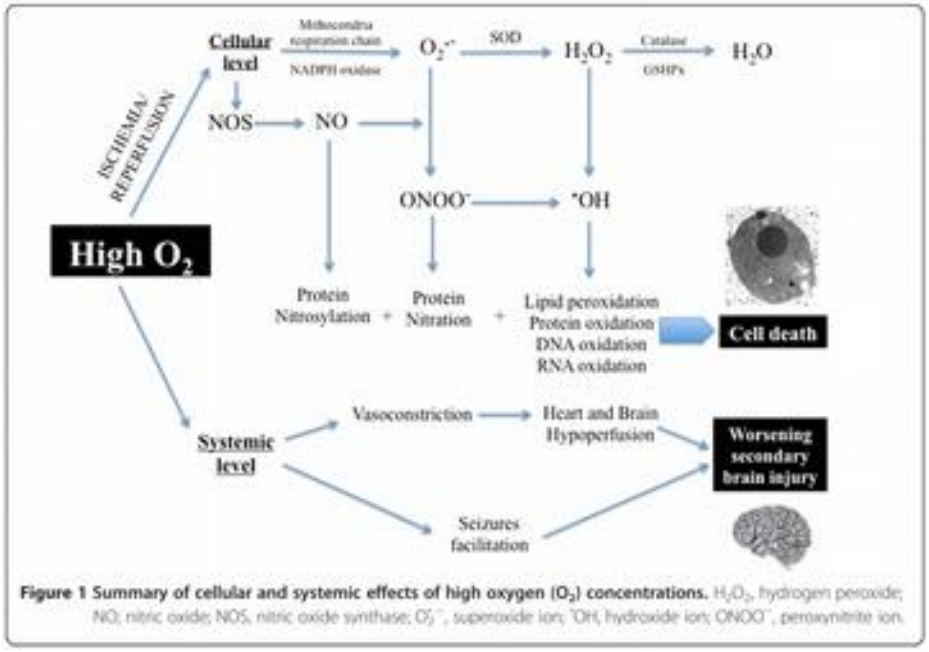


Figure 1 Summary of cellular and systemic effects of high oxygen (O_2) concentrations. H_2O_2, hydrogen peroxide; NO, nitric oxide; NOS, nitric oxide synthase; $O_2^{\cdot-}$, superoxide ion; $^{\cdot}OH$, hydroxide ion; $ONOO^-$, peroxynitrite ion.

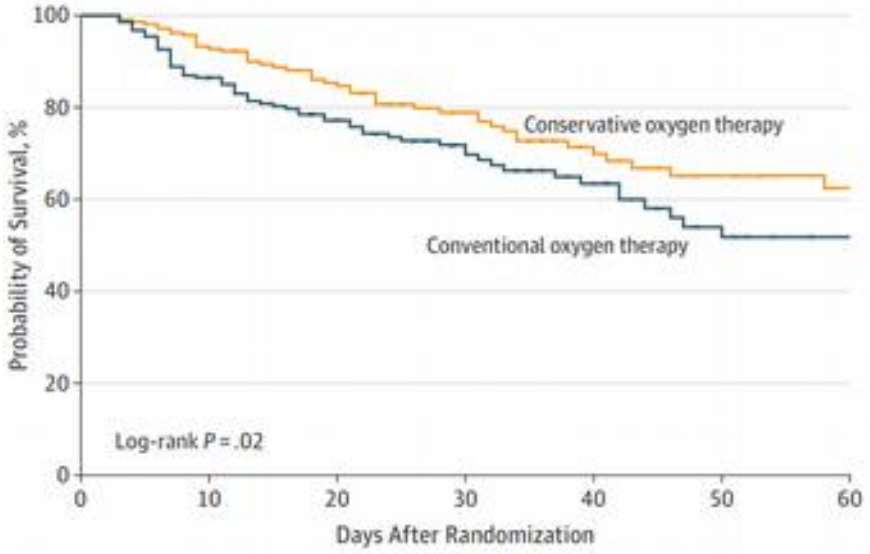
Dell'Anna et al. Critical Care 2014, 18:555

JAMA | Preliminary Communication | CARING FOR THE CRITICALLY ILL PATIENT

Effect of Conservative vs Conventional Oxygen Therapy on Mortality Among Patients in an Intensive Care Unit
The Oxygen-ICU Randomized Clinical Trial

Massimo Girardis, MD; Stefano Busani, MD; Elisa Damiani, MD; Abele Donati, MD; Laura Rinaldi, MD; Andrea Marudi, MD; Andrea Morelli, MD; Massimo Antonelli, MD; Mervyn Singer, MD, FRCA

Figure 2. Probability of Survival From Study Inclusion (Day 0) Through Day 60 for Patients in the Conservative and Conventional Oxygen Strategy Groups



No. at risk							
Conservative oxygen therapy	216	201	188	181	173	170	169
Conventional oxygen therapy	218	189	172	163	158	152	152

Patients discharged alive from the hospital were considered to have survived, and their median follow-up was 22 days for the conservative group (interquartile range, 13-37) and 24 days for the conventional group (interquartile range, 15-35).

Girardis, et al. *JAMA 2016, 316(15), 1583-9.*

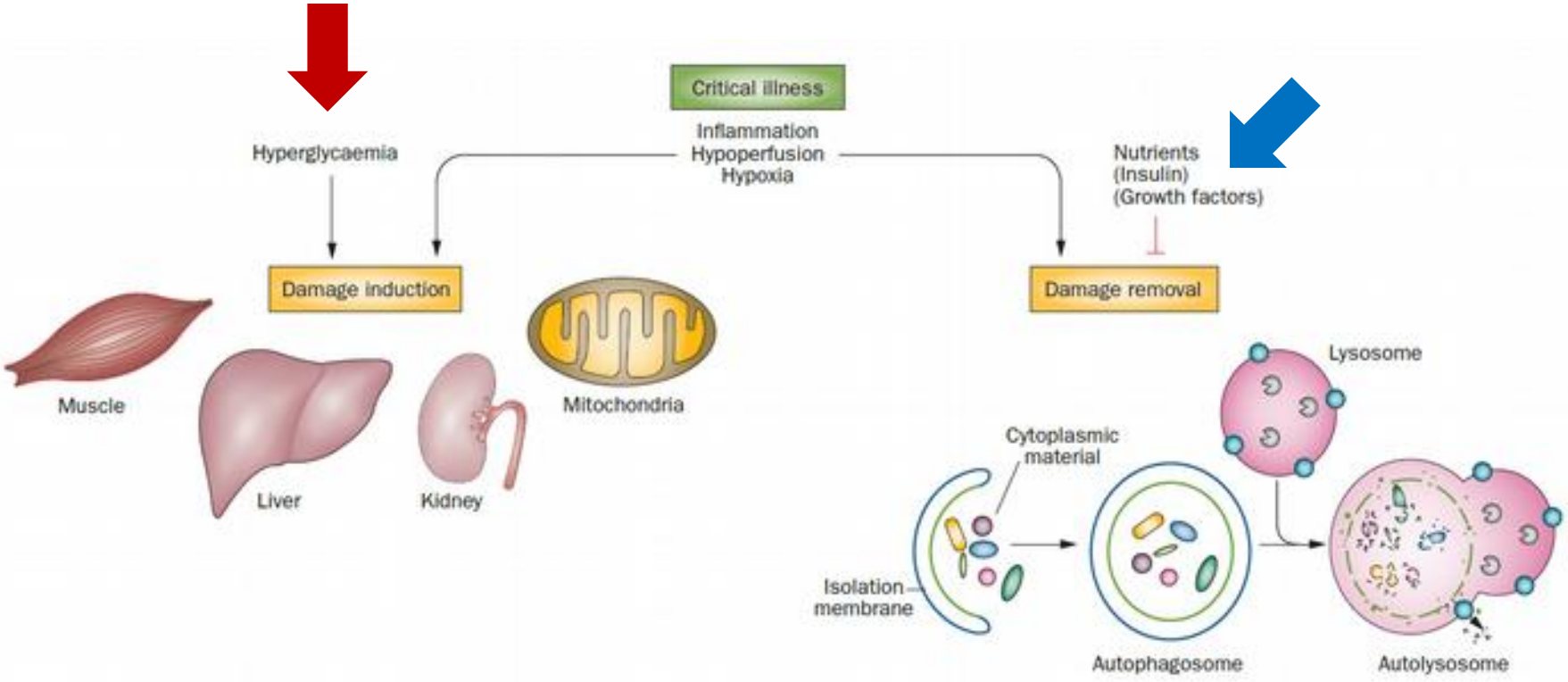


Figure 2 | Balance between damage induction and removal in critical illness. Critical illness represents a 'multiple hit' insult on cells, with damage induced by hypoxia, hypoperfusion and inflammation. Hyperglycaemia adds to such cell damage. Removal of cell damage (by autophagy) is essential for recovery. Suppressive effects by nutrients early during critical illness could compromise such damage removal systems. Conversely, when cell damage removal systems are fully functional, perhaps the damage evoked by moderate hyperglycaemia could be dealt with. This hypothesis remains to be investigated.

Van den Berghe, G. Nat. Rev. Endocrinol 2012. 8;374–378

Česká diabetologická společnost ČLS JEP

Doporučený postup péče o diabetes mellitus 2. typu

Za ČDS: J. Škrha, T. Pelikánová, M. Kvapil

Revize ze dne: 1. 8. 2017

Tab. 1: Cíle léčby nemocného s diabetem

Ukazatel		Požadovaná hodnota
HbA1c (mmol/mol)*		< 45 (< 60)
Glykémie v žilní plazmě	nalačno/před jídlem (mmol/l)	≤ 6,0 (< 7,0)
Hodnoty glykémie v plné	kapilární krvi (selfmonitoring)	
	nalačno/před jídlem (mmol/l)	4,0–6,0 (< 8,0)
	postprandiální (mmol/l)	5,0–7,5 (< 9,0)
Krevní tlak (mmHg)		< 130/80 (< 140/90)

Association between intensive care unit–acquired dysglycemia and in-hospital mortality*

Omar Badawi, PharmD; Michael D. Waite, MD; Steven A. Fuhrman, MD; Ilene H. Zuckerman, PharmD, PhD

Design: Retrospective, observational study.

Setting: eICU Research Institute participating hospitals with an active tele-ICU program.

Patients: A total of 194,772 patients with length of stay >48 hrs.

Interventions: None.

Table 5. Relative risk of hospital mortality by categories of dysglycemia (n = 98,011)

	Unadjusted RR Hospital Mortality (95% CI)	Adjusted[a] RR Hospital Mortality (95% CI)	Glucocorticoid Adjusted[b] RR Hospital Mortality (95% CI)
Maximum average daily glucose, mg/dL			
<80	1.45 (0.95–2.24)	1.40 (0.90–2.18)	0.99 (0.49–2.03)
80–110	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
110–150	1.62 (1.50–1.76)	1.13 (1.04–1.58)	1.12 (1.01–1.24)
150–180	3.20 (2.94–3.48)	1.43 (1.30–1.58)	1.38 (1.22–1.55)
180–240	4.71 (4.33–5.12)	1.63 (1.47–1.81)	1.51 (1.33–1.72)
240–300	6.01 (5.43–6.65)	1.76 (1.55–1.99)	1.57 (1.34–1.84)
>300	7.05 (6.23–7.98)	1.89 (1.62–2.19)	1.78 (1.48–2.15)
Lowest glucose level, mg/dL			
<20	4.85 (3.99–5.88)	1.67 (1.37–2.03)	1.69 (1.35–2.12)
20–40	4.52 (4.14–4.93)	1.53 (1.37–1.70)	1.55 (1.37–1.76)
40–60	2.75 (2.58–2.94)	1.12 (1.04–1.21)	1.10 (1.00–1.20)
60–80	1.62 (1.55–1.69)	1.06 (1.01–1.11)	1.04 (0.98–1.10)
80–110	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
>110	1.36 (1.29–1.44)	1.50 (1.42–1.59)	1.42 (1.32–1.53)
Glucose variability (quintiles)[c]			
0–20th percentile	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
20–40th percentile	1.58 (1.46–1.72)	1.27 (1.17–1.38)	1.21 (1.10–1.34)
40–60th percentile	2.11 (1.95–2.27)	1.41 (1.30–1.53)	1.38 (1.25–1.53)
60–80th percentile	2.72 (2.53–2.93)	1.45 (1.33–1.59)	1.36 (1.22–1.52)
80–100th percentile	3.94 (3.67–4.23)	1.61 (1.47–1.78)	1.56 (1.39–1.75)

[a]Adjusted for age, sex, race, operative admission diagnosis, history of diabetes, Acute Physiology and Chronic Health Evaluation IV score, admission glucose, admission temperature, number of glucose values per patient day, highest temperature, white blood cell count, serum sodium, and serum creatinine throughout the intensive care unit (ICU) stay, duration of mechanical ventilation, year of ICU admission, and ICU-acquired acute renal injury, respiratory failure and sepsis. [b]Adjusted for glucocorticoids in addition to primary model (n = 69,208). [c]Thresholds for percentiles of glucose variability (coefficient of variation) were 20th percentile = 0.10; 40th percentile = 0.15; 60th percentile = 0.19; 80th percentile = 0.25; and 100th percentile = 1.67.

Badawi et al.
Crit Care Med 2012; 40:3180-3188

Hyperglycemia–related mortality in critically ill patients varies with admission diagnosis*

Mercedes Falciglia, MD; Ron W. Freyberg, MS; Peter L. Almenoff, MD; David A. D'Alessio, MD; Marta L. Render, MD

Design: **Retrospective cohort study.**

Setting: **173 U.S. medical, surgical, and cardiac intensive care units.**

Patients: **259,040 admissions; unadjusted mortality rate, 11.2%.**

Interventions: **None.**

Table 2. Hyperglycemia is associated with increased mortality for the entire cohort and across all intensive care unit types, levels of severity of illness, and length of stay

			Adjusted Odds Ratio (95% Confidence Interval)[a] Mean Glucose, mg/dL			
Cohort	No.	*p*	111–145	146–199	200–300	>300
Total	259,040	<.0001	1.31 (1.26–1.36)	1.82 (1.74–1.90)	2.13 (2.03–2.25)	2.85 (2.58–3.14)
Diabetes	77,850	<.0001	1.13 (1.02–1.26)	1.49 (1.35–1.65)	1.88 (1.69–2.08)	2.76 (2.38–3.20)
No diabetes	180,084	<.0001	1.35 (1.30–1.41)	2.14 (2.04–2.24)	2.91 (2.71–3.11)	4.04 (3.44–4.75)
Intensive care unit						
Cardiac	20,359	<.0001	1.68 (1.43–1.97)	2.27 (1.91–2.69)	2.42 (1.97–2.98)	3.85 (2.63–5.62)
Medical	19,501	<.0001	1.40 (1.25–1.57)	1.86 (1.65–2.10)	2.08 (1.80–2.40)	2.39 (1.79–3.18)
Surgical	71,672	<.0001	1.06 (0.96–1.16)	1.56 (1.42–1.73)	1.86 (1.63–2.12)	2.92 (2.20–3.89)
Medical/cardiac	60,212	<.0001	1.38 (1.28–1.48)	1.77 (1.64–1.91)	2.01 (1.83–2.21)	2.70 (2.26–3.23)
Mixed	87,296	<.0001	1.36 (1.27–1.45)	1.96 (1.83–2.10)	2.36 (2.16–2.56)	2.98 (2.55–3.48)
Severity of illness: predicted mortality (% likelihood of death)						
<2.5%	116319	<.0001	1.71 (1.41–2.08)	2.32 (1.89–2.85)	2.85 (2.22–3.65)	3.10 (1.91–5.01)
2.5–5%	42765	<.0001	1.46 (1.26–1.69)	2.20 (1.89–2.56)	2.38 (1.97–2.87)	3.58 (2.57–4.98)
5–10%	34978	<.0001	1.52 (1.37–1.69)	2.00 (1.79–2.24)	2.50 (2.18–2.86)	2.72 (2.07–3.56)
10–30%	38214	<.0001	1.43 (1.33–1.52)	1.95 (1.82–2.09)	2.21 (2.03–2.41)	2.71 (2.30–3.19)
>30%	26764	<.0001	1.05 (0.99–1.12)	1.49 (1.39–1.59)	1.79 (1.65–1.94)	2.89 (2.44–3.43)
Length of stay						
1 day	2,153	<.0001	1.52 (1.02–2.27)	1.56 (1.03–2.36)	1.79 (1.18–2.71)	4.08 (2.52–6.59)
2 days	51,171	<.0001	1.14 (1.02–1.28)	1.58 (1.39–1.78)	1.87 (1.62–2.16)	2.67 (2.15–3.31)
3 days	64,693	<.0001	1.28 (1.16–1.41)	1.65 (1.49–1.83)	1.97 (1.74–2.23)	2.89 (2.32–3.60)
3–6 days	88,121	<.0001	1.19 (1.11–1.27)	1.73 (1.61–1.87)	1.91 (1.74–2.10)	2.33 (1.92–2.83)
>6 days	52,902	<.0001	1.27 (1.18–1.35)	1.80 (1.68–1.93)	2.31 (2.11–2.52)	3.09 (2.44–3.92)

[a]Reference group is the mean glucose category with normoglycemia (70–110 mg/dL).

Krinsley and Preiser *Critical Care* (2015) 19:179
DOI 10.1186/s13054-015-0908-7

CRITICAL CARE

RESEARCH Open Access

Time in blood glucose range 70 to 140 mg/dl >80% is strongly associated with increased survival in non-diabetic critically ill adults

James S Krinsley[1*] and Jean-Charles Preiser[2]

Medicine®

OBSERVATIONAL STUDY

OPEN

Perioperative Blood Glucose Levels <150 mg/dL are Associated With Improved 5-Year Survival in Patients Undergoing On-Pump Cardiac Surgery

A Prospective, Observational Cohort Study

Ashham Mansur, MD, Aron Frederik Popov, MD, Ameen Abu Hanna, PhD, Ingo Bergmann, MD, Ivo Florian Brandes, MD, Tim Beissbarth, PhD, Martin Bauer, PhD, and José Hinz, PhD

Abstract: Hyperglycemia is common during and after Coronary Artery Bypass Graft Surgery (CABGS) and has been shown to be associated with poor clinical outcomes. In this study, we hypothesized that a moderate perioperative mean blood glucose level of <150 mg/dL improves long-term survival in cardiac surgery patients. We conducted a prospective, observational cohort study in the heart center of the University Medical Center of Goettingen, Germany. Patients undergoing on-pump cardiac surgery were enrolled in this investigation. After evaluating perioperative blood glucose levels, patients were classified into 2 groups based on mean glucose levels: Glucose ≥150 mg/dL and Glucose <150 mg/dL. Patients were followed up for 5 years, and mortality within this period was recorded as the primary outcome parameter. Secondary outcome parameters included the length of ICU stay, the use of inotropic agents, the length of hospital stay, and the in-hospital mortality. A total of 455 consecutive patients who underwent cardiac surgery with cardiopulmonary bypass were enrolled in this investigation. A Kaplan–Meier survival analysis of the 5-year mortality risk revealed a higher mortality risk among patients with glucose levels ≥150 mg/dL ($P = 0.0043$, log-rank test). After adjustment for confounders in a multivariate Cox regression model, the association between glucose ≥150 mg/dL and 5-year mortality remained significant (hazard ratio, 2.10; 95% CI, 1.30–3.39; $P = 0.0023$). This association was corroborated by propensity score matching, in which Kaplan–Meier survival analysis demonstrated significant improvement in the 5-year survival of patients with glucose levels <150 mg/dL ($P = 0.0339$). Similarly, in-hospital mortality was significantly higher in patients with glucose ≥150 mg/dL compared with patients with glucose <150 mg/dL. Moreover, patients in the Glucose ≥150 mg/dL group required significantly higher doses of the inotropic agent Dobutamine (mg/d) compared with patients in the Glucose <150 mg/dL group (20.6 ± 62.3 and 10.5 ± 40.7, respectively; $P = 0.0104$). Moreover, patients in the Glucose ≥150 mg/dL group showed a significantly longer hospital stay compared with patients in the Glucose <150 mg/dL group (28 ± 23 and 24 ± 19, respectively; $P = 0.0297$). We conclude that perioperative blood glucose levels <150 mg/dL are associated with improved 5-year survival in patients undergoing cardiac surgery. More studies are warranted to explain this effect.

(*Medicine* 94(45):e2035)

Abbreviations: APACHE II = Acute Physiology and Chronic Health Evaluation Score, BMI = body mass index, CABGS = coronary artery bypass graft surgery, CI = cardiac index, CVP = central venous pressure, ECMO = extracorporeal membrane oxygenation, HR = heart rate, IABP = intra-aortic balloon pump, ICU = intensive care unit, MAP = mean arterial pressure, PAP = mean pulmonary artery pressure, PCWP = pulmonary capillary wedge pressure, PVRI = pulmonary vascular resistance index, SAPS II = Simplified Acute Physiology Score, SVRI = systemic vascular resistance index.

Table 2. ICU Glucose Control (From the Beginning of Operation to the End of ICU Stay)

	Nondiabetic Subjects		Diabetic Subjects	
	PERI Group	POST Group	PERI Group	POST Group
No. of patients	869	910	265	339
Average blood glucose, mmol/L				
Whole period	6.5 ± 0.6	6.6 ± 0.8	6.9 ± 1.0	7.1 ± 0.8[a]
Intraoperative period	6.8 ± 1.1	7.0 ± 1.2[a]	7.7 ± 1.9	8.3 ± 1.8[a]
Time in TGC target range (4.4–6.1 mmol/L), %	40.8 ± 13.6	39.7 ± 13.8	34.3 ± 12.7[a]	30.8 ± 11.5
Time in GC range (4.4–8.3 mmol/L), %	82.5 ± 11.1[a]	79.7 ± 12.5	68.8 ± 14.6[a]	65.2 ± 13.9
Time above target range (>8.3 mmol/L), %	12.5 ± 10.2	13.9 ± 11.8[b]	21.1 ± 15.6	26.1 ± 13.8[a]
Time below target range (<4.4 mmol/L), %	5.0 ± 5.2	6.4 ± 5.6[a]	10.1 ± 5.7[c]	8.7 ± 5.9
Moderate hypoglycemia (2.2–3.2 mmol/L), no. of measurements/all measurements), %	267/40 766 (0.7)	419/45 100 (0.9)[a]	241/15 553 (1.5)	266/17 755 (1.5)
Severe hypoglycemia <2.2 mmol/L (no. of measurements/all measurements), %	20/40 766 (0.1)	33/45 100 (0.1)	24/15 553 (0.2)	28/17 755 (0.2)

Table 4. Perioperative Morbidity and Mortality: Nondiabetic and Diabetic Subjects

	Nondiabetic Subjects			Diabetic Subjects		
	PERI Group	POST Group	AD or RR(95% CI)	PERI Group	POST Group	AD or RR(95% CI)
No. of patients	869	910	41	265	339	74
Perioperative mortality, no of patients (%)	19 (2.2)	33 (3.6)	0.60 (0.35 to 1.05)	18 (6.8)	15 (4.4)	1.54 (0.79–2.99)
Perioperative morbidity, no of patients (%)	185 (21.3)	307 (33.7)[c]	0.63 (0.54 to 0.74)	78 (29.4)	119 (35.1)	0.84 (0.66–1.06)
Complications, no. of events (%)						
Cardiovascular	109 (12.5)	193 (21.2)[c]	0.59 (0.48 to 0.73)	26 (9.8)	64 (18.9)[b]	0.52 (0.34–0.80)
Respiratory	56 (6.4)	69 (7.6)	0.85 (0.60 to 1.19)	16 (6.0)	25 (7.4)	0.82 (0.45–1.50)
Renal	54 (6.2)	92 (10.1)[b]	0.61 (0.45 to 0.85)	34 (12.8)	39 (11.5)	1.12 (0.72–1.72)
Gastrointestinal	22 (2.5)	46 (5.1)[b]	0.50 (0.30 to 0.83)	11 (4.2)	20 (5.9)	0.70 (0.34–1.44)
Neurological	8 (0.9)	60 (6.6)[c]	0.14 (0.07 to 0.29)	22 (8.3)	22 (6.5)	1.28 (0.72–2.26)
Infectious	24 (2.7)	60 (6.6)[c]	0.42 (0.26 to 0.67)	12 (4.5)	29 (8.6)	0.53 (0.28–1.02)

Data are expressed as means ± SD or absolute number with relative percentage. The difference between the groups was expressed as absolute difference (AD) for numerical data or relative risk (RR) for categorical data, both with 95% CI. The AD and RR values are unadjusted. [a] $P < .05$. [b] $P < .01$. [c] $P < .001$.

ORIGINAL RESEARCH

Trends in Glycemic Control Over a 2-Year Period in 126 US Hospitals

Sophie Bersoux, MD, MPH[1]*, Curtiss B. Cook, MD[2], Gail L. Kongable, RN, MSN, FNP[3], Jianfen Shu, MS[4]

[1]Division of Community Internal Medicine Mayo Clinic, Scottsdale, Arizona; [2]Divisions of Endocrinology and Preventive, Occupational, and Aerospace Medicine, Mayo Clinic, Scottsdale, Arizona; [3]Department of Neurosurgery and Department of Neurology, University of Virginia, Charlottesville, Virginia; [4]Department of Statistics, University of Virginia, Charlottesville, Virginia.

OBJECTIVE: Report data on glucose control from 126 U.S. hospitals (**Jan -Dec 2009**)

RESULTS: The **mean BG** was **166 mg/dL**

The prevalence of **hyperglycemia** (>180 mg/dL) was **28%**

Original Article

BENCHMARKING GLYCEMIC CONTROL IN U.S. HOSPITALS

Sophie Bersoux, MD, MPH[1]; Curtiss B. Cook, MD[2]; Gail L. Kongable, RN, MSN, FNP[3]; Jianfen Shu, PhD[3]; Denise R. Zito, BS, MT (ASCP)[4]

OBJECTIVE: Report data on glucose control from 635 U.S. hospitals (Jan -Dec 2012)

RESULTS: In total, 12,178,002 POC-BG measurements from 575,084 ICU patients were analyzed.

The **mean BG** was **170 mg/dL**

The prevalence of **hyperglycemia** (>180 mg/dL) was **28.2%**

The prevalence of **hypoglycemia** (<70 mg/dL) was **5.6%**

The patient-day-weighted mean glucose and prevalence of hypoglycemia were highest in the smallest hospitals, in rural hospitals, and in hospitals located in the Northeast (all P<.01).

Bersoux et al. Endocr Pract. 2014;20:876-883

The New England Journal of Medicine

VOLUME 345 NOVEMBER 8, 2001 NUMBER 19

INTENSIVE INSULIN THERAPY IN CRITICALLY ILL PATIENTS

GREET VAN DEN BERGHE, M.D., PH.D., PIETER WOUTERS, M.SC., FRANK WEEKERS, M.D., CHARLES VERWAEST, M.D., FRANS BRUYNINCKX, M.D., MIET SCHETZ, M.D., PH.D., DIRK VLASSELAERS, M.D., PATRICK FERDINANDE, M.D., PH.D., PETER LAUWERS, M.D., AND ROGER BOUILLON, M.D., PH.D.

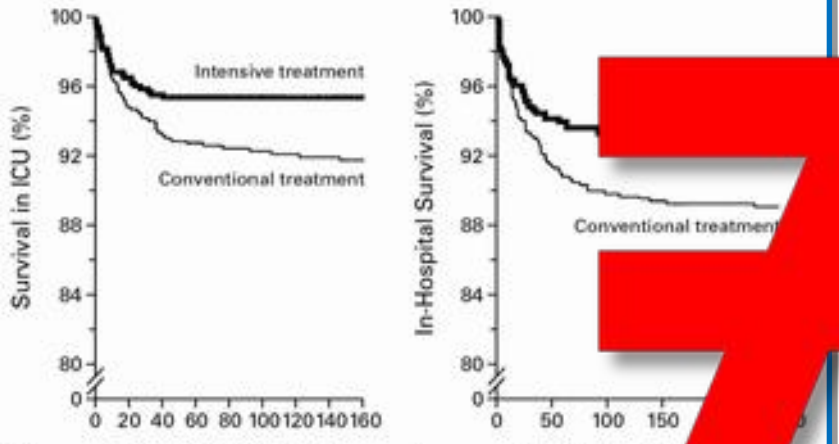


Figure 1. Kaplan–Meier Curves Showing Cumulative Survival of Patients Who Received Intensive Insulin Treatment or Conventional Treatment in the Intensive Care Unit (ICU).

Patients discharged alive from the ICU (Panel A) and from the hospital (Panel B) were considered to have survived. In both cases, the differences between the treatment groups were significant (survival in ICU, nominal $P=0.005$ and adjusted $P<0.04$; in-hospital survival, nominal $P=0.011$. P values were determined with the use of the Mantel–Cox log rank test.

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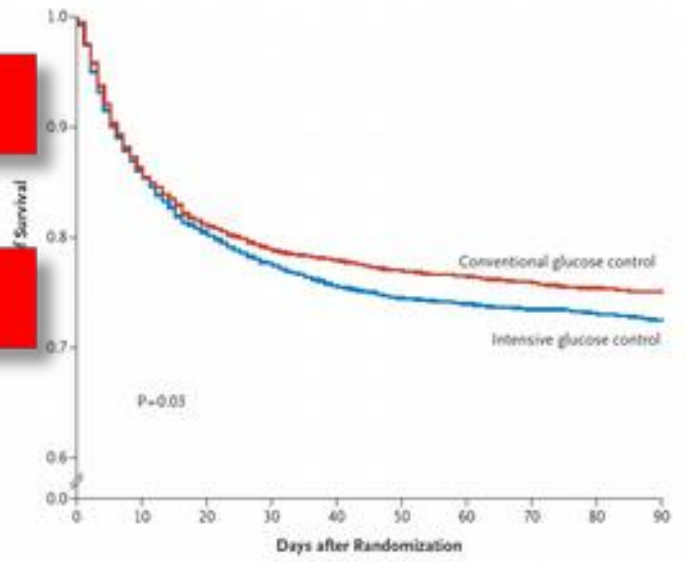
The NEW ENGLAND JOURNAL of MEDICINE

MARCH 26, 2009

Intensive versus Conventional Glucose Control in Critically Ill Patients

The NICE-SUGAR Study Investigators*



The NEW ENGLAND JOURNAL of MEDICINE

MARCH 26, 2009

Intensive versus Conventional Glucose Control in Critically Ill Patients

The NICE-SUGAR Study Investigators*

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Intensive Insulin Therapy and Pentastarch Resuscitation in Severe Sepsis

Frank M. Brunkhorst, M.D., Christoph Engel, M.D., Frank Bloos, M.D., Ph.D.,

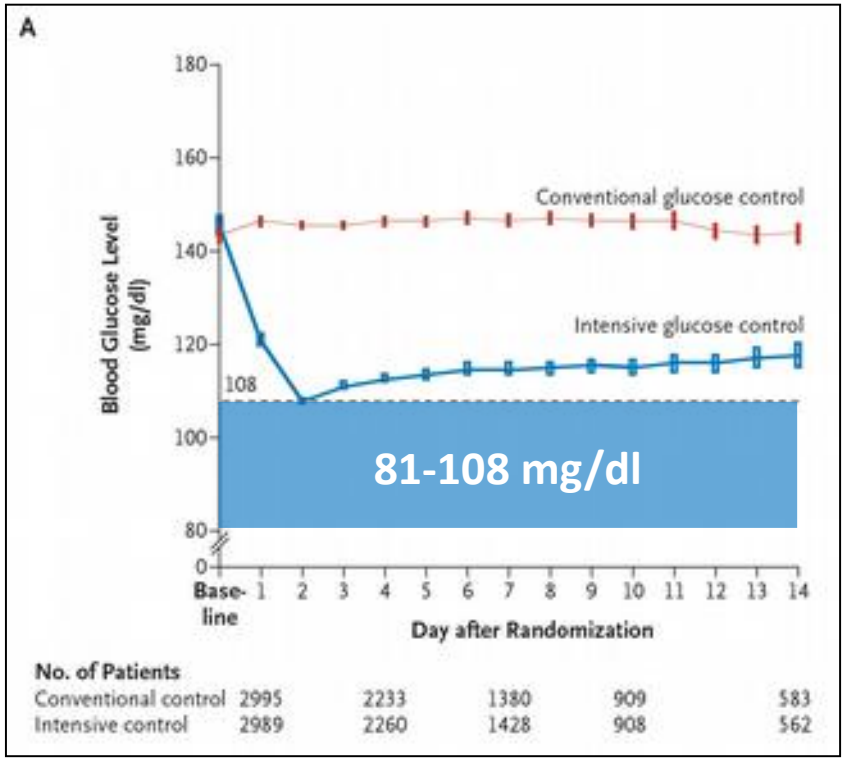


Figure 2. Data on Blood Glucose Level, According to Treatment Group.

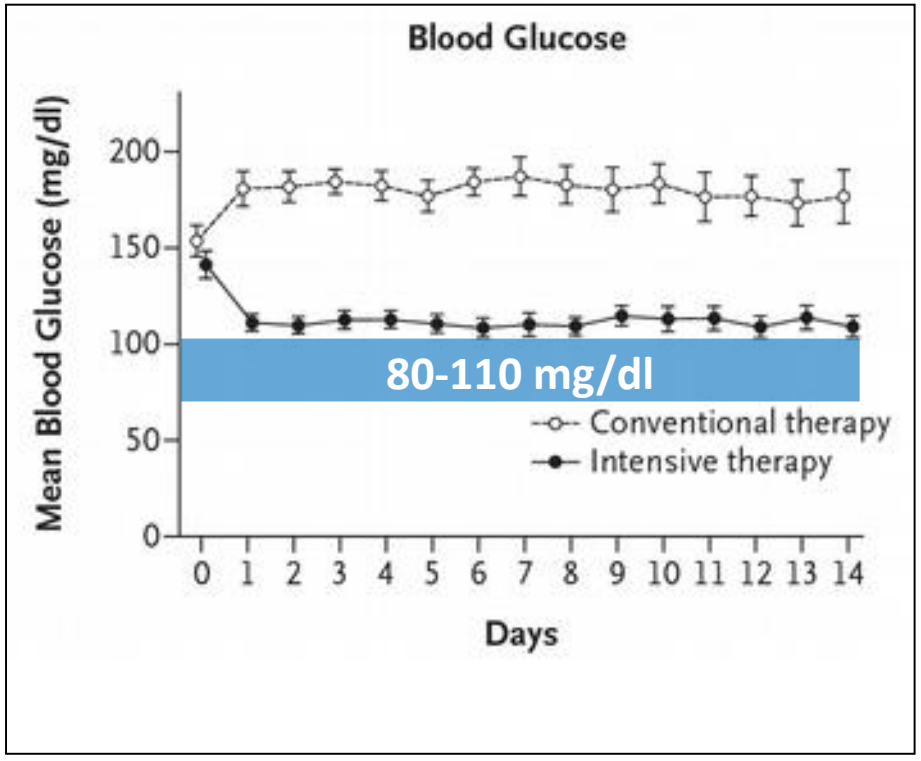


Figure 1. The mean morning blood glucose level.

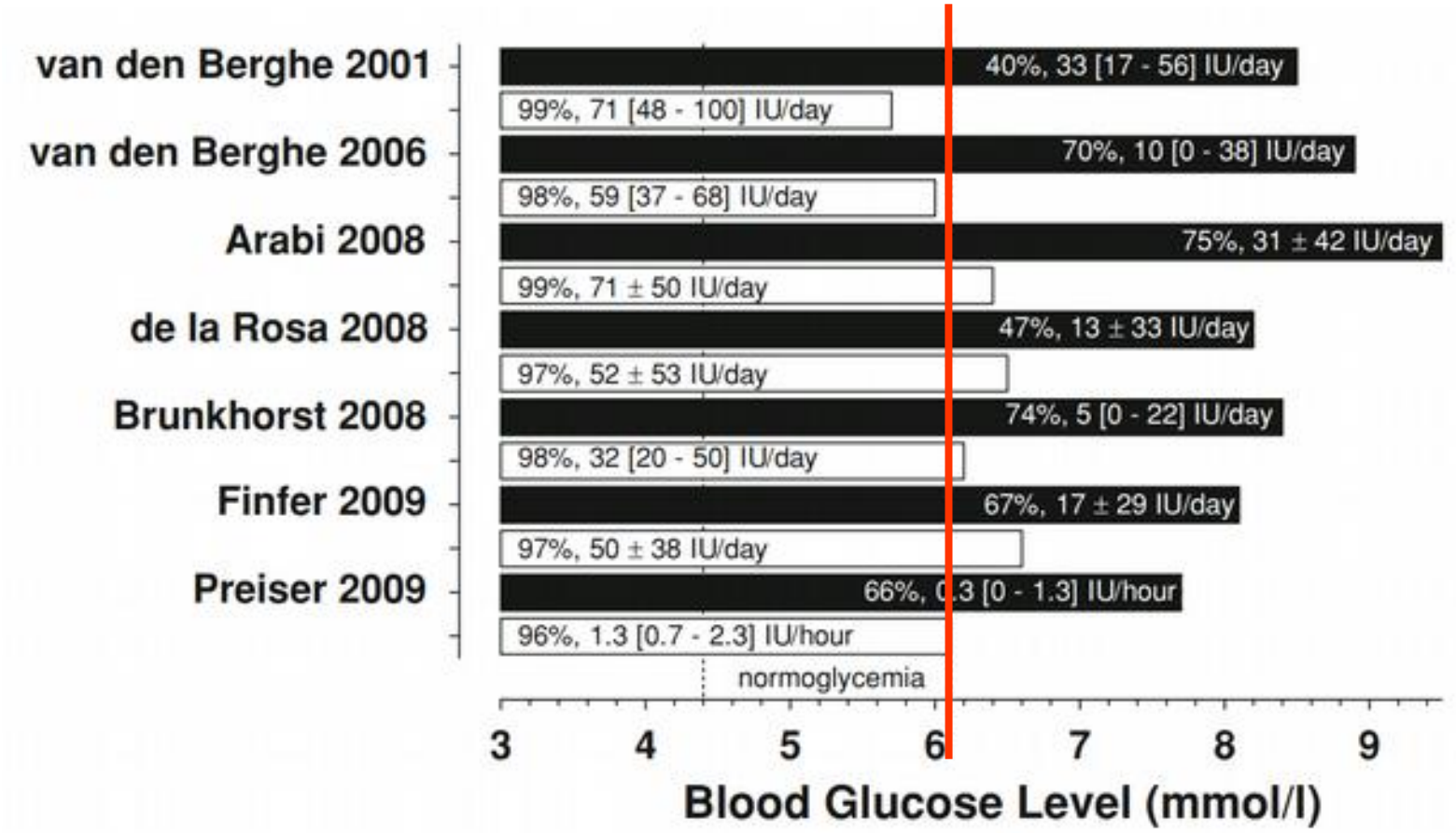


Fig. 1 Blood glucose levels, percentage of patients treated with insulin and insulin dose (mean ± standard deviation or median [interquartile range] in the control or conventional group (*filled bars*) and tight glycemic control group (*open bars*) of seven randomized controlled trials

Schultz MJ et al. Intensive Care Med. 2010; 36(1): 173-4.

SOUHRN

1. Koncept kontroly glykémie je správný, ale v současné době ho nedokážeme bezpečně realizovat,

2. ani neznáme optimální hladiny glykémie pro jednotlivé skupiny pacientů.

3. Ale neexistuje žádný důvod tolerovat hladiny nad 8.3 mmo/l.

4. Kontinuální měření glykémie je nepochybně nutností.

RESEARCH ARTICLE Open Access

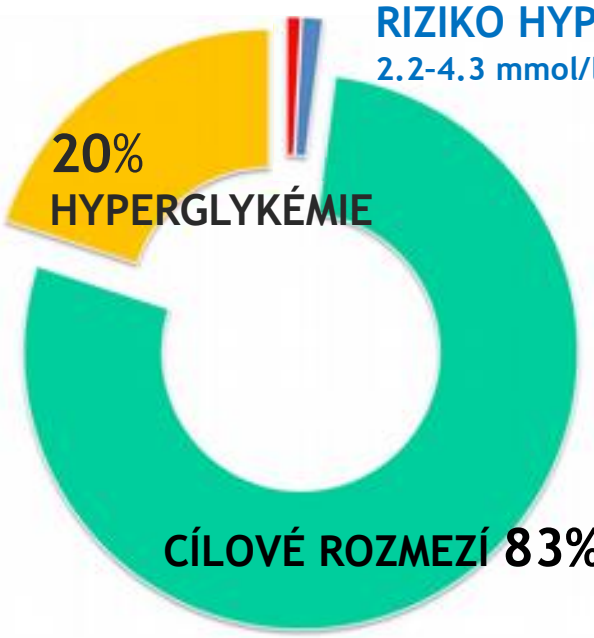
Space GlucoseControl system for blood glucose control in intensive care patients - a European multicentre observational study

Jan Blaha[1*], Barbara Barteczko-Grajek[2], Pawel Berezowicz[3], Jiri Charvat[4], Jiri Chvojka[5], Teodoro Grau[6], Jonathan Holmgren[7], Ulrich Jaschinski[8], Petr Kopecky[1], Jan Manak[9], Mette Moehl[10], Jonathan Paddle[11], Marcello Pasculli[12], Johan Petersson[13], Sirak Petros[14], Danilo Radrizzani[15], Vinodkumar Singh[16] and Joel Starkopf[17]

Table 2 Blood glucose control characteristics (508 patients)

Blood glucose level at entry [mmol.l^{-1}]	9.3 (6.8–12.3)
Time to reach target range [hours]	4.5 (2.3–8.3)
Mean insulin infusion rate [U/h]	3.3 (2.3–5.1)
Whole study period	
Mean blood glucose level [mmol.l^{-1}]	6.9 (6.6–7.7)
Severe hypoglycaemia <2.2 mmol.l^{-} [Number of patients/number of episodes]	4 (0.8)/4 (0.01)
Hypoglycaemia 2.2–4.3 mmol.l^{-1} [% of time]	0.2 (0–1.4)
Target range [% of time]	83.0 (68.7–93.1)
Hyperglycaemia >8.3 mmol.l^{-1} [% of time]	14.7 (6.1–29.5)

Data are presented as median (IQR) or number (%)



Blaha J; et al. BMC Anesthesiol. 2016. 16(1):8

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