Citation	Abstract	Findings
Kwon S, Thompson R,	Objective	Insulin administration for patients with
Dellinger P, Yanez D,	To determine the relationship of perioperative hyperglycemia and insulin	hyperglycemia intra and postoperatively
Farrohki E, Flum D.	administration on outcomes in elective colon/rectal and bariatric operations.	reduced risk of complications
Importance of		
perioperative glycemic	Background	
control in general	There is limited evidence to characterize the impact of perioperative	
surgery: a report from	hyperglycemia and insulin on adverse outcomes in patients, with and without	
the Surgical Care and	diabetes, undergoing general surgical procedures.	
Outcomes Assessment		
Program. Ann Surg.	Methods	
2013 Jan;257(1):8-14.	The Surgical Care and Outcomes Assessment Program is a Washington State	
doi:	quality improvement benchmarking-based initiative. We evaluated the	
10.1097/SLA.0b013e31	relationship of perioperative hyperglycemia (>180 mg/dL) and insulin	
827b6bbc. PMID:	administration on mortality, reoperative interventions, and infections for patients	
23235393; PMCID:	undergoing elective colorectal and bariatric surgery at 47 participating hospitals	
PIVIC4208433.	between fourth quarter of 2005 and fourth quarter of 2010.	
	Results Of the 11,633 patients (55.4 ± 15.3 years; 65.7% women) with a serum glucose determination on the day of surgery, postoperative day 1, or postoperative day 2, 29.1% of patients were hyperglycemic. After controlling for clinical factors, those with hyperglycemia had a significantly increased risk of infection [odds ratio (OR) 2.0; 95% confidence interval (Cl), 1.63–2.44], reoperative interventions (OR, 1.8; 95% Cl, 1.41–2.3), and death (OR, 2.71; 95% Cl, 1.72–4.28). Increased risk of poor outcomes was observed both for patients with and without diabetes. Those with hyperglycemia on the day of surgery who received insulin had no significant increase in infections (OR, 1.01; 95% Cl, 0.72–1.42), reoperative interventions (OR, 1.29; 95% Cl, 0.89–1.89), or deaths (OR, 1.21; 95% Cl, 0.61–2.42). A dose-effect relationship was found between the effectiveness of insulin-related glucose control (worst 180–250 mg/dL, best <130 mg/dL) and adverse outcomes. Conclusions Perioperative hyperglycemia was associated with adverse outcomes in general surgery patients with and without diabetes. However, patients with hyperglycemia who received insulin were at no greater risk than those with normal blood	
	glucoses. Perioperative glucose evaluation and insulin administration in patients with hyperglycemia are important quality targets.	

Kotagal M. Symons RG.	Objective: To study the association between diabetes status, perioperative	Using data from SCOAP. cohort study
Hirsch IB Umpierrez	hyperglycemia and adverse events in a statewide surgical cohort	evaluating diabetes status perioperative
GE Dellinger FP		hyperglycemia and composite adverse events
Farrokhi FT Flum DR	Background: Perioperative hyperglycemia may increase the risk of adverse events	in abdominal vascular and spine surgery at 53
SCOAP-CERTAIN	more significantly in patients without diabetes (NDM) than in those with diabetes	hospitals in WA state
Collaborative	(DM)	
Perioperative		For patients without diabetes, risk of adverse
hyperglycemia and risk	Methods: Using data from the Surgical Care and Outcomes Assessment Program, a	events was linked to hyperglycemia and they
of adverse events	cohort study (2010-2012) evaluated diabetes status, perioperative hyperglycemia	were less likely to receive insulin
among nationts with	and composite adverse events in addominal vascular and spine surgery at 53	
and without diabetes	hospitals in Washington State	
Ann Surg 2015	hospitals in washington state.	
Ann Surg. 2015	Posults: Among 10,826 patients (mean age 54 years: 52.6% wemen) 10% had	
	diabates: 47% underwant a perioperative blood ducese (PG) test, and of these	
10.1097/3LA.00000000	18% had PG >180 mg/dl. DM nationts had a higher rate of adverse events (12% vs	
25132032: PMCID:	$10\%$ had $BO \ge 100$ mg/dL. DW patients had a mgnet fate of adverse events (12% vs 0% $P < 0.001$ ) than NDM patients. After adjustment among NDM patients those	
DMC4208020	with hyperglycomia had an increased rick of adverse events compared with these	
FIVIC4208939.	with normal BG. Among NDM patients, there was a dose-response relationship	
	hotwoon the level of PC and composite advorce events (odds ratio (OP) 1.2 for PC	
	125 180 (0E% confidence interval /Cl) 1 1 1 5); OP 1 6 for PG >180 (0E% Cl 1 2	
	2.1)] Conversely, hyperglycomic DM patients did not have an increased risk of	
	2.1)]. Conversely, hypergrycennic Divi patients did not nave an increased risk of advarsa avants, including those with a PC 180 or more (OP, 0.8, 0.5% Cl. 0.6, 1.0)	
	adverse events, including those with a BG 180 of more (OR, 0.8, 95% Cl, 0.6-1.0).	
	NDM patients were less likely to receive insulin at each BG level.	
	Conclusions: For NDM patients, but not DM patients, the risk of adverse events	
	was linked to hyperglycemia. Underlying this paradoxical effect may be the	
	underuse of insulin, but also that hyperglycemia indicates higher levels of stress in	
	NDM patients than in DM patients.	
Frisch A, Chandra P,	OBJECTIVE	Observational retrospective cohort study of all
Smiley D, Peng L, Rizzo	Hospital hyperglycemia, in individuals with and without diabetes, has been	patients at Emory University Hospital from Jan
M, Gatcliffe C, Hudson	identified as a marker of poor clinical outcome in cardiac surgery patients.	<ul> <li>Jun 2007 from the specialties of general</li> </ul>
M, Mendoza J, Johnson	However, the impact of perioperative hyperglycemia on clinical outcome in	surgery, neurosurgery, surgical oncology,
R, Lin E, Umpierrez GE.	general and noncardiac surgery patients is not known.	orthopedic, vascular, thoracic, urology,
Prevalence and clinical		otolaryngology (except tonsillectomy), and
outcome of	RESEARCH DESIGN AND METHODS	gynecology.
hyperglycemia in the	This was an observational study with the aim of determining the relationship	<ul> <li>Excluded were outpatient surgical</li> </ul>
perioperative period in	between pre- and postsurgery blood glucose levels and hospital length of stay	procedures or those with a length of
noncardiac surgery.	(LOS), complications, and mortality in 3,184 noncardiac surgery patients	stay (LOS) <24 h or with minor

Diabetes Care. 2010	consecutively admitted to Emory University Hospital (Atlanta, GA) between 1	surgical procedures including
Aug;33(8):1783-8. doi:	January 2007 and 30 June 2007.	endoscopic procedures and
10.2337/dc10-0304.		ophthalmologic surgery
Epub 2010 Apr 30.	RESULTS	
PMID: 20435798;	The overall 30-day mortality was 2.3%, with nonsurvivors having significantly	
PMCID: PMC2909062.	higher blood glucose levels before and after surgery (both P < 0.01) than survivors.	
	Perioperative hyperglycemia was associated with increased hospital and intensive	
	care unit LOS (P < 0.001) as well as higher numbers of postoperative cases of	
	pneumonia (P < 0.001), systemic blood infection (P < 0.001), urinary tract infection	
	(P < 0.001), acute renal failure (P = 0.005), and acute myocardial infarction (P =	
	0.005). In multivariate analysis (adjusted for age, sex, race, and surgery severity),	
	the risk of death increased in proportion to perioperative glucose levels; however,	
	this association was significant only for patients without a history of diabetes (P =	
	0.008) compared with patients with known diabetes (P = 0.748).	
	CONCLUSIONS	
	Perioperative hyperglycemia is associated with increased LOS, hospital	
	complications, and mortality after noncardiac general surgery. Randomized	
	controlled trials are needed to determine whether perioperative diabetes	
	management improves clinical outcome in noncardiac surgery patients.	
<u>Jiang J, Li S, Zhao Y,</u>	Study objective	<ul> <li>Intensive glucose control</li> </ul>
<u>Zhou Z, Zhang J, Sun R,</u>	To evaluate the impact of intensive glucose control on diabetic patients	intraoperatively and postoperatively
Luo A. Intensive	undergoing surgery.	is associated with a reduction in
glucose control during		postoperative complications
the perioperative	Design	regardless of target glucose, but also
period for diabetic	A systematic review and meta-analysis of randomized controlled trials. PubMed,	an increase in hypoglycemia.
patients undergoing	CENTRAL, EMBASE, ISI Web of Science, and CINAHL databases were searched from	<ul> <li>Further high quality studies needed</li> </ul>
surgery: An updated	inception to 13 December 2020.	to understand how to avoid
systematic review and		hypoglycemia in perioperative period
meta-analysis. J Clin	Setting	
<u>Anesth. 2021</u>	Operating room, postoperative recovery area and ward, up to 30 days after	
<u>Dec; /5:110504. doi:</u>	surgery.	
<u>10.1016/j.jclinane.2021</u>	Deficite	
.110504. Epub 2021	Patients Dishotia nationta undergoing surgeny	
<u>Sep 9. PIVIID:</u>	Diabetic patients undergoing surgery.	
<u>54503300.</u>	Interventions	
	Interventions	

	We used Review Manager 5.4 to pool the data with a random-effects model. The	
	quality of evidence was rated using the Grading of Recommendations,	
	Assessment, Development and Evaluation system.	
	Measurements	
	The primary outcomes were infectious complications, postoperative mortality, and	
	hypoglycaemia. The secondary outcomes included atrial fibrillation, myocardial	
	infarction, stroke, delirium, renal failure, postoperative mechanical ventilation	
	time, length of intensive care unit (ICU) stay, and hospital stay.	
	Main results	
	Thirteen studies involving 1582 participants were included. Compared with	
	conventional glucose control, intensive glucose control was associated with a	
	lower risk of infectious complications (risk ratio [RR], 0.35; 95% confidence	
	interval [CI], 0.19–0.63; low-quality evidence), atrial fibrillation (RR, 0.55; 95% CI,	
	0.42–0.71; high-quality evidence), and renal failure (RR, 0.38; 95% Cl, 0.15–0.95;	
	difference (MD) $-0.55$ day: 95% CL $-1.05$ to $-0.05$ days: very-low-quality	
	evidence) and hospital (MD, $-1.61$ days; 95% Cl, $-2.78$ to $-0.44$ days; very-low-	
	quality evidence). However, intensive glucose control was associated with a higher	
	risk of hypoglycaemia (RR, 3.00; 95% CI, 1.97–4.55; high-quality evidence). There	
	were no significant differences in postoperative mortality, myocardial infarction,	
	stroke, delirium, or postoperative mechanical ventilation time.	
	Conclusions	
	Intensive glucose control in diabetic patients is associated with a reduction in	
	some adverse postoperative outcomes including infectious complications, but also	
	appears to increase the risk of hypoglycaemia. Further well-designed studies may	
	be needed to determine appropriate regimens to reduce hypoglycaemia	
Sormkacomsin V	Inclaence.	Prospective schort study of pen dishetic
Rungreungvanich M	Intraoperative hyperglycemia has been associated with multiple postoperative	natients (n=440) adults receiving general
Apinyachon W,	complications such as surgical site infection, myocardial infarction, stroke, and	anesthesia for intermediate-high risk surgerv
Sangasilpa I, Srichot W,	death. These complications are not confined to only diabetic patients. However,	were enrolled –Definition of intermediate-to
Pisitsak C. Incidence	the incidence of intraoperative hyperglycemia in non-diabetic patients has not	high-risk surgery was followed a guideline
and risk factors of	been fully elucidated. Additionally, these patients' risk factors were not well	from European Society of Cardiology and
intraoperative	established in previous studies.	European Society of Anaesthesiology
hyperglycemia in non-		

10.1 A		
diabetic patients: a	Methods	Patients were followed for 30 days
prospective	Four hundred forty non-diabetic patients who underwent intermediate- to high-	postoperatively for incidence of SSI
observational study.	risk surgery were included in the study. We prospectively measured the capillary	
BMC Anesthesiol. 2022	blood glucose level in all patients during surgery. The incidence of intraoperative	Most of the patients in this study underwent
<u>Sep 10;22(1):287. doi:</u>	hyperglycemia was defined as at least one episode of blood glucose level of more	major gastrointestinal surgery (n = 121,
<u>10.1186/s12871-022-</u>	than 180 mg/dL. Risk factors for hyperglycemia were assessed using multivariable	27.50%), neurosurgery (n = 91, 20.68%), or
01829-9. PMID:	logistic regression analysis.	gynecological surgery (n = 77, 17.50%). Only
36088294; PMCID:		cardiovascular thoracic (CVT) surgery was
<u>PMC9463729</u> .	Results	associated with increased intraoperative
	Sixty-five (14.7%) patients developed hyperglycemia during surgery. The	hyperglycemia
	independent risk factors for intraoperative hyperglycemia were an American	
	Society of Anesthesiologists status ≥ 3 (odds ratio [OR] 6.09, 95% confidence	Surgical site infection rate was higher for
	interval [CI]: 2.67–13.89, p < 0.001), preoperative impaired fasting blood sugar (OR	patients with intraoperative hyperglycemia
	2.28, 95%CI:1.13–4.61, p = 0.021), duration of anesthesia ≥ 3 h (OR 4.06, 95%CI:	
	1.23–13.45, p = 0.021), intraoperative hypotension (OR 5.37, 95%CI: 2.35–12.29,	ASA physical status, long surgical duration,
	p < 0.001), intraoperative blood transfusion (OR 4.35, 95%CI: 2.15–8.79,	blood transfusion and intraoperative
	p < 0.001), and steroid use (OR 2.39, 95%CI: 1.20–4.76, p = 0.013). Surgical site	hypotension were related to stress
	infection was higher in patients with intraoperative hyperglycemia compared with	hyperglycemia
	patients without intraoperative hyperglycemia (4 [6.1%] vs. 6 [1.6%], respectively,	
	p = 0.035).	BG should be monitored in patients
		undergoing intermediate and high risk
	Conclusion	operative procedures who have risk factors
	The incidence of intraoperative hyperglycemia was significant in non-diabetic	(e.g., ASA physical status >3)
	natients during intermediate- to high-risk surgery. Risk factors should be identified	
	to prevent intraoperative hyperglycemia.	
Bucataru A. Balasoiu M.	Surgical site infections persist as a substantial concern within the realm of	Systematic review of risk factors for surgical
Ghenea AF. Zlatian OM.	hospital-acquired infections. This enduring issue is further compounded by the	site infection. Open Access articles only
Vulcanescu DD. Horhat	mounting challenge of antibiotic resistance, a surge in surgical interventions, and	
FG, Bagiu IC, Sorop VB,	the presence of comorbidities among patients. Thus, a comprehensive exploration	Two-pronged approach to reducing surgical
Sorop MI, Oprisoni A,	of all discernible risk factors, as well as proactive preventive and prophylactic	site infection looking at patient-level risk
Boeriu E, Mogoanta SS.	strategies, becomes imperative. Moreover, the prevalence of multidrug-resistant	factors and process/procedural risk factors
Factors Contributing to	microorganisms has reached alarming proportions. Consequently, there is an	
Surgical Site Infections:	acute need to investigate and scrutinize all potential therapeutic interventions to	Included 26 retrospective, prospective and 1
A Comprehensive	counter this burgeoning threat. Consequently, the primary objective of this review	case-control study.
Systematic Review of	is to meticulously assess the origins and risk elements intertwined with surgical	
Etiology and Risk	site infections across a diverse spectrum of surgical procedures. As the medical	Colorectal: ASA score, diabetes, BMI>30 were
Factors. Clin Pract.	landscape continues to evolve, this critical analysis seeks to provide a nuanced	identified as strong association with SSI;
2023 Dec 28;14(1):52-	understanding of the multi-faceted factors contributing to surgical site infections,	

68. doi:	with the overarching aim of facilitating more effective management and mitigation	Abdominal: 16.3% incidence rate of SSI,
10.3390/clinpract14010	strategies. By exploring these dimensions comprehensively, we endeavor to	emergency surgery and prolonged operation
006. PMID: 38248430;	enhance patient safety and the quality of surgical care in this era of evolving	length were most significant
PMCID: PMC10801486.	healthcare challenges.	Orthopedic: extended preop stay & elevated
		FBG were risk factors for SSI
		Cardiovascular/Cardiac: Diabetes mellitus one
		of the most prevalent risk factors
		Obstetrics: risk factors include inadequate
		preop antibioitics, intraoperative blood
		transfusions, comorbidities
		Neurosurg: ABX prophylaxis lower incidence
		of SSI, longer operation times risk factor
		Spinal Surg: no mention of BG
		Patient related factors emerged as significant
		contributors – advanced age, higher BMI,
		comorbidities – diabetes and
		immunosuppression were commonly cited
		Duration and complexity also increased SSI
		risk.
		SSIs independently correlated with ASA 3+,
		longer/more complicated surgical procedures,
		DM
Chen JY, Nassereldine	Importance Surgical complications associated with perioperative hyperglycemia	In cohort study of 969 patients with diabetes
H, Cook SB, Thornblade	are conventionally associated with diabetes, but, paradoxically, prior cohort	and 4899 patients without diabetes, adjusted
LW, Dellinger EP, Flum	studies have found that patients without diabetes have greater risk of	odds of experiencing any type of
DR. Paradoxical	complications at similar levels of hyperglycemia compared with patients with	postoperative complication were consistently
Association of	diabetes.	higher for patients without diabetes than for
Hyperglycemia and		those with diabetes across a range of elevated
Surgical Complications	Objective To describe the association between perioperative hyperglycemia and	BG levels
Among Patients With	surgical complications in a population of surgical patients without diabetes	
and Without Diabetes.	receiving routine blood glucose testing and insulin administration and to evaluate	Near universal BG testing and frequent insulin
JAMA Surg.	the potential correlation of perioperative hyperglycemia.	use, patients without diabetes paradoxically
2022;157(9):765-770.		had worse outcomes than patients with
doi:10.1001/jamasurg.	Design, Setting, and Participants This retrospective cohort study of National	diabetes at similar levels of hyperglycemia –
2021.5561	Surgical Quality Improvement Program–defined complications after operation	broader insulin use may improve outcomes
	took place at a single academic medical center hospital from January 2013 to	
	October 2016. Consecutive patients undergoing general, vascular, and gynecologic	

	operations who were expected to have at least a 48-hour admission were	
	included. Hyperglycemia was defined as blood glucose level of 140 mg/dL or	
	higher within 24 hours after surgery. Multivariate regression was used to assess	
	the association of hyperglycemia and complications, stratified by hyperglycemia	
	severity and adjusted for diabetes status. Analysis began in February 2022.	
	Exposures Routine blood glucose testing and insulin administration.	
	Main Outcomes and Measures. The main outcomes are odds of experiencing	
	nation outcomes and measures the main outcomes are outs of experiencing	
	perioperative hypergrycemia and postoperative complication, comparing patients	
	with and without diabetes.	
	Results A total of 7634 patients (mean [SD] age, 53.5 [15.1] years; 6664 patients	
	without diabetes [83.3%] and 970 patients with diabetes [17.7%]) underwent	
	general (6204 [81.3%]), vascular (208 [2.7%]), and gynecologic (1222 [16%])	
	operations. Of these, 5868 (77%) had blood glucose testing (4899 individuals	
	without diabetes [73.5%] and 969 [99.9%] with diabetes). Hyperglycemia occurred	
	in 882 patients with diabetes (91%) and 2484 patients without diabetes (50.7%).	
	Of those with blood glucose level more than $180 \text{ mg/dL}$ , $1388 (72.7\%)$ received	
	insulin (658 patients with diabetes who had hyperglycemia [91%] and 680 patients	
	without diabetes who had hyperglycemia [61%]). Adjusted odds of experiencing a	
	complication were 83% greater for natients without vs with diabetes at blood	
	glucose level of 140 to 179 mg/dl (odds ratio 1.83 [95% Cl. $0.93-3.6$ ]) 49%	
	grapter for blood glucose level of 180 to 240 mg/dL (odds ratio $1.05  (5.5)  (0.55$	
	1 06 2 11]) and 8% greater for blood glucose level mare than 250 mg/dL (odds	
	1.00-2.11]), and 86% greater for blood glocose lever more than 250 mg/dc (buds	
	radio, 1.88 [95% Cl, 1.11-3.17]). A similar trend was observed for senous	
	complications. Insulin may mitigate the association of hypergiveenia and	
	complications in patients without diabetes.	
	Conclusions and Relevance In this study, with near universal blood glucose testing	
	and frequent insulin use, patients without diabetes paradoxically had worse	
	outcomes than patients with diabetes at similar levels of hyperglycemia. Insulin	
	may mitigate this effect and broader use may improve outcomes.	
Hyperglycemia as a Risk	Bodily injury and stress associated with surgical interventions increase glucose	Recommendations include:
Factor in the	levels not only in individuals diagnosed with diabetes mellitus but also in patients	<ul> <li>Improve clinical assessment with</li> </ul>
Perioperative Patient	without a preoperative diagnosis of diabetes. Whatever the cause, hyperglycemia	admission testing of glucose level
https://www.sciencedir	is becoming an increasingly important indicator of perioperative patient	and HbA1c – if glucose is >180
ect.com/science/article	outcomes. An elevated blood glucose level affects the body's defense systems and	mg/dL, consult with staff members.

<u>14050</u>	closely monitor the patient's blood glucose levels and watch for signs of hyperglycemia throughout the perioperative experience. Perioperative nurses should work collaboratively with other perioperative team members to identify and treat perioperative hyperglycemia.	<ul> <li>Become part or collaborate effort to develop hospital protocol for glucose control in surgical patients with and without diabetes to maintain BG &lt;140mg/dL</li> <li>Perform BG checks every 2 hours during surgery if longer than 2 hours and patient's preoperative BG was &gt;110mg/dL</li> <li>Be prepared to implement insulin infusion as needed</li> <li>Perform postoperative BG checks with initial vital signs on all patients in PACU</li> <li>Develop postoperative monitoring protocols for patients with BG level of &gt;180mg/dL</li> <li>At discharge, provide patient teaching about signs and symptoms of increased hyperglycemia and infection or nonhealing that would require medical attention</li> <li>Consider referral to endocrinologist after surgery</li> </ul>
Hyporglycomia stross		Koy Points
hypergiycemia, stress induced <u>https://www-</u> <u>clinicalkey-</u> <u>com.offcampus.lib.was</u> <u>hington.edu/#!/content</u> <u>/clinical_overview/67-</u> <u>s2.0-V2042#approach-</u> <u>to-treatment-heading-</u> <u>hd022</u>		<ul> <li>When patients are initiated on glucocorticoid therapy (prednisone equivalent greater than 20 mg/day), start glucose monitoring</li> <li>Consider oral therapy for mild hyperglycemia in the outpatient setting</li> <li>Insulin should be used for moderate to severe hyperglycemia and in the inpatient setting</li> </ul>

		<ul> <li>Poststeroid hemoglobin A1C is imperative to assess whether patient has developed diabetes</li> <li>Alarm Signs and Symptoms</li> <li>A blood glucose level greater than 200 mg/dL requires closer monitoring and initiation of antihyperglycemic therapy</li> <li>Signs and symptoms of diabetic ketoacidosis or hyperosmolar byperglycemic state require hospital</li> </ul>
		admission
Procedure Specific:		
<u>Spine</u>		
Upadhyaya S, Lopez WY, Goh BC, Chen AF, Blucher JA, Beck A, Kang JD, Schoenfeld AJ. Post-operative hyperglycemia and its association with surgical site infection after instrumented spinal fusion. Clin Neurol Neurosurg. 2020 Oct;197:106100. doi: 10.1016/j.clineuro.202 0.106100. Epub 2020 Jul 20. PMID: 32717563.	Objective: To evaluate the correlation between postoperative hyperglycemia and surgical site infection among patients who underwent primary instrumented spinal fusion surgery. Patients and methods: We collected data on all eligible patients treated at our institution over the course of 2005-2017. We defined serum hyperglycemia using a primary threshold of serum glucose $\geq$ 140 mg/dL and used $\geq$ 115 mg/dL as a secondary test. We used logistic regression techniques to evaluate unadjusted results for serum hyperglycemia on revision surgeries for infection, followed by sequential adjustment for sociodemographic and procedural characteristics. Results: We included 3664 patients. Surgical site infections occurred in 4%. Postoperative hyperglycemia was significantly associated with a higher rate of revision surgery for infection (p = 0.02). Following adjusted analysis, hyperglycemia remained a statistically significant predictor for revision surgery due to infection (OR 2.19; 95 % CI 1.13, 4.25). Similar results were evident when using the lower threshold of $\geq$ 115 mg/dL (OR 2.36; 95 % CI 1.06, 5.23).	Retrospective cohort study of 3664 patients who underwent spinal fusion surgery evaluating correlation between postoperative hyperglycemia and surgical site infection. Postoperative hyperglycemia defined as BG > 140mg/dL & secondary test of >115mg/dL on POD1 with metabolic panel or finger stick BG Postoperative hyperglycemia is a statistically significant indicator of revision surgery due to infection for patients undergoing spinal fusion
	Conclusions: This study highlights the importance of measuring serum glucose after spinal fusion and the need for heightened surveillance and/or treatment in those who exhibit postoperative hyperglycemia. In this context, it could be advantageous to use a lower threshold for hyperglycemia (115 mg/dL) in order to trigger interventions for glycemic control.	

Varieur BM, Chua TL,	Background context: Diabetes mellitus (DM) is a common comorbidity among	Retrospective cohort study of 106 patients
Tobert DG, Fogel HA,	patients undergoing spinal fusion for adult spinal deformity (ASD) surgery. An	from two large academic medical centers
Hershman SH. Glycemic	elevated Hemoglobin A1c (HbA1c) and elevated postoperative glucose have been	from 2021-2023 to investigate glycemic
laboratory values are	shown to increase the risk of complications following spine and other orthopedic	control and ASD surgery complications
associated with	surgeries; however, data is limited for ASD.	association.
increased length of stay		
and 90-day revision risk	Purpose: To investigate glycemic control and ASD surgery to inform surgical	Higher preoperative HbA1c correlated with
following surgical	decision making, medical optimization, and patient education.	increased LOS, and 90-day revision following
management of adult		surgery for ASD, increased risk of revision
spinal deformity. Spine	Study design/setting: Retrospective cohort.	surgery with each unit increase in HbA1c
J. 2025 Mar;25(3):581-		
587. doi:	Patient sample: Total of 106 adult patients undergoing surgical correction for ASD	Postoperative glycemic control is also
10.1016/j.spinee.2024.	with an HbA1c drawn within 6 months preoperatively or 2 weeks postoperatively	associated with 90-day revision risk – keeping
10.016. Epub 2024 Nov	and valid plasma glucose levels throughout postoperative hospital stay.	BG < 165mg/dL on average may decrease this
4. PMID: 39505013.		risk
	Outcome measures: Length of stay, 90-day wound complication, 90-day	
	readmission, 90-day revision.	
	Methods: All patients undergoing spinal fusion of seven or more levels between	
	2021 and 2023 at two large academic medical centers were identified using	
	institutional data acquisition software. Medical charts were then manually	
	reviewed to obtain and confirm demographic, laboratory, and surgical	
	characteristics and outcomes. Laboratory characteristics included preoperative	
	HbA1c, mean postoperative glucose (PG), and maximum PG. Surgical	
	characteristics and outcomes included procedure time, estimated blood loss (EBL),	
	length of inpatient stay (LOS), transfusion requirement, 90-day complications, 90-	
	day revision, and 90-day readmission. Bivariate analysis was performed followed	
	by simple and multiple regression analysis. Odds ratios were established relative	
	to the laboratory threshold values informed by receiver operating characteristics.	
	Results: Of 872 original procedures identified, 106 patients (12.2%) were adults	
	with preoperative HbA1c and postoperative plasma glucose measurements who	
	underwent surgery for a diagnosis of ASD. Median patient age was 67 years (IQR	
	59-72 years), 59 (55.7%) were temale, and 96 (90.6%) were of Caucasian race.	
	Median LOS was 7 days (IQR 5-10 years) and median HbA1c was 5.9% (IQR 5.3%-	
	6.5%). Higher preoperative HbA1c was correlated with increased LOS (R=0.22,	
	p=.023). The odds ratio for patients requiring extended LOS was 2.49 (95% CI 1.06-	
	5.86, p=.034) for those with HbA1c ≥6.3%. Multiple regression analysis of LOS	

	identified HbA1c [B= 1.51 (95% CI 0.32-2.70), p=.013] as a positive predictor of LOS and mean PG [B= -0.05 (95% CI -0.10 to (-0.01)), p=.019] as a weakly negative predictor of LOS. Upon simple logistic regression, the odds ratio for 90-day revision was 1.81 (95% CI 1.02-3.19, p=.042) for every unit increase in HbA1c. Patients with mean PG ≥165 mg/dL [OR=5.76 (95% CI 1.28-26.01), p=.024] were at increased risk for 90-day revision. Glycemic laboratory values do not seem to predict 90-day wound complications or 90-day readmission following surgery for ASD.	
	Conclusion: Elevated preoperative HbA1c is associated with increased LOS and risk for revision within 90 days of ASD surgery. Postoperative hyperglycemia is also associated with increased 90-day revision risk. To our knowledge, this study is the first to evaluate HbA1c and outcomes following ASD surgery. These findings can be leveraged to inform preoperative medical optimization and highlight the importance of glycemic control in ASD patients undergoing corrective surgical intervention.	
Spine Surgery and Preoperative Hemoglobin, Hematocrit, and Hemoglobin A1c: A Systematic Review <u>https://journals.sagepu</u> <u>b.com/doi/full/10.1177</u> /2192568220979821	Study Design: Systematic review. Objectives: Synthesize previous studies evaluating clinical utility of preoperative Hb/Hct and HbA1c in patients undergoing common spinal procedures: anterior cervical discectomy and fusion (ACDF), posterior cervical fusion (PCF), posterior lumbar fusion (PLF), and lumbar decompression (LD). Methods: We queried PubMed, Embase, Cochrane Library, and Web of Science for literature on preoperative Hb/Hct and HbA1c and post-operative outcomes in adult patients undergoing ACDF, PCF, PLF, or LD surgeries. Results: Total of 4,307 publications were assessed. Twenty-one articles met inclusion criteria. PCF and ACDF: Decreased preoperative Hb/Hct were significant predictors of increased postoperative morbidity, including return to operating room, pulmonary	2021 Systematic review of 21 articles synthesizing previous studies evaluating clinical utility of preoperative HbHct and HbA1c in patients undergoing common spinal procedures Decreased preoperative Hb/Hct were significant predictors of increased postoperative morbidity (return to OR, pulm complications, transfusions, increased LOS) Increased HbA1c was associated with increased postoperative infection and hospital stay cost Hct values <35-38% and HbA1c >6.5-6.9% for identifying patients at higher risk of postop
	postoperative morbidity, including return to operating room, pulmonary complications, transfusions, and increased length of stay (LOS). For increased HbA1c, there was significant increase in risk of postoperative infection and cost of hospital stay. PLF:	identifying patients at higher risk of postop complications is supported by the literature – obtain these labs as part of routine postop risk stratification

		Decreased Hb/Hct was reported to be associated with increased risk of	
		postoperative cardiac events, blood transfusion, and increased LOS. Elevated	
		HbA1c was associated with increased risk of infection as well as higher visual	
		analogue scores (VAS) and Oswestry disability index (ODI) scores.	
		LD:	
		LOS and total episode of care cost were increased in patients with preoperative	
		HbA1c elevation.	
		Conclusion:	
		In adult patients undergoing spine surgery, preoperative Hb/Hct are clinically	
		useful predictors for postoperative complications, transfusion rates, and LOS, and	
		HbA1c is predictive for postoperative infection and functional outcomes. Using Hct	
		values <35-38% and HbA1c >6.5%-6.9% for identifying patients at higher risk of	
		postoperative complications is most supported by the literature. We recommend	
		obtaining these labs as part of routine pre-operative risk stratification.	
	Tao, Xu MAa; Matur,	Study Design.	Systematic review of 22 studies reviewing
	Abhijith V. MDb;	Systematic review and meta-analysis.	association between preoperative HbA1c and
	Palmisciano, Paolo		postoperative outcomes following spine
	MDa; Conteh, Fatu S.	Objective.	surgery
	MDc; Onyewadume,	To perform a systematic review and meta-analysis of previous studies on HbA1c in	
	Louisa MDd; Duah,	preoperative risk stratification in patients undergoing spinal procedures and	Main outcomes were all-cause postoperative
	Henry O. MPHe;	provide an overview of the consensus recommendations.	complication rate – secondary outcomes
	Shukla, Geet BAa;		included 30 day hospital readmissions, length
	Vorster, Phillip BSa;	Summary of Background Data.	of in-hospital stay (LOS) hospital cost, surgical
	Gupta, Sahil BSa;	Diabetes mellitus (DM) and hyperglycemia have been shown to be independent	site infection, recovery ratio, patient reported
	Chilakapati, Sai S. BSf;	risk factors for increased surgical complications. Glycated Hemoglobin A1C	outcomes.
	Adogwa, Owoicho	(HbA1c), a surrogate for long term glycemic control, is an important preoperative	
	MDa. Preoperative	parameter that may be optimized to reduce surgical complications and improve	Preoperative HbA1 > 8% most common cut off
	HbA1c and	patient-reported outcomes. However, comprehensive systematic reviews on	for comparison among identified studie – and
	Postoperative	preoperative HbA1c and postoperative outcomes in spine surgery have been	associated with significantly higher all-cause
	Outcomes in Spine	limited.	complications, developing an SSI.
	Surgery: A Systematic		
	Review and Meta-	Methods.	17/22 identified studies demonstrated
	Analysis. Spine	We systematically searched PubMed, EMBASE, Scopus, and Web-of-Science for	preoperative HbA1c was predictive of
	48(16):p 1155-1165,	English-language studies from inception through April 5th, 2022, including	complications or worse patient-reported
	August 15, 2023.   DOI:	references of eligible articles. The search was conducted according to PRISMA	outcomes.
	10.1097/BRS.00000000	guidelines. Only studies in patients undergoing spine surgery with preoperative	
	00004703	HbA1c values and postoperative outcomes available were included.	Less clear studies for cut-off point between
1			6.5-8% HgA1c - need further large

	Results. A total of 22 articles (18 retrospective cohort studies, 4 prospective observational studies) were identified with level of evidence III or greater. The majority of studies (n=17) found that elevated preoperative HbA1c was associated with inferior outcomes or increased risk of complications. Random-effect meta-analysis demonstrated that patients with preoperative HbA1c >8.0% had increased risk(s) of postoperative complications (RR: 1.85, 95% CI: [1.48, 2.31], P<0.01) and that patients with surgical site infection (SSI) had higher preoperative HbA1c (Mean Difference: 1.49%, 95% CI: [0.11, 2.88], P=0.03).	prospective studies to understand optimal cut off point and relationship between PROs and HbA1c
	Conclusion. The findings of this study suggest that HbA1c >8.0% is associated with an increased risk of complications. HbA1c was higher by 1.49% on average among patients with SSI when compared to patients who did not experience SSI. These results suggest that elevated HbA1c is associated with less favorable outcomes following spine surgery.	
Procedure Specific: Joints		
https://www- clinicalkey- com.offcampus.lib.was hington.edu/service/co ntent/pdf/watermarke d/1-s2.0- S0883540318301499.p df?locale=en_US&searc hIndex= Inadequate Glycemic Control Is Associated With Increased Surgical Site Infection in Total Joint Arthroplasty: A Systematic Review and Meta-Analysis	Background The association between inadequate glycemic control and surgical site infection (SSI) following total joint arthroplasty (TJA) remains unclear. The aim of this study is to assess the relationship between perioperative glycemic control and the risk for SSI, mainly periprosthetic joint infection. Methods We searched OVID-MEDLINE, Embase, and Web of Science from inception up to June 2017. The main independent variable was glycemic control as defined by glycated hemoglobin (HbA1C) or perioperative glucose values. The main outcome was SSI. Publication year, location, study design, sample population (size, age, gender), procedure, glycemic control assessment, infection outcome, results, confounders, and limitations were assessed. Studies included in the meta-analysis had stratified glycemic control using a distinct HbA1C cut-off. Results Seventeen studies were included in this study. Meta-analysis of 10 studies suggested that elevated HbA1C levels were associated with a higher risk of SSI after TJA (pooled odds ratio 1.49, 95% confidence interval 0.94-2.37, P = .09) with significant heterogeneity between studies (12 = 81.32%, P < .0001). In a subgroup	<ul> <li>Systematic review of 17 studies looking at relationship between perioperative glycemic control and the risk for SSI – mainly periprosthetic joint infection. Meta-analysis of 10 studies included in this review.</li> <li>Association exists between inadequate glycemic control and postoperative SSI</li> <li>Patients with inadequate glycemic control should be optimized preoperatively and notified about increased risk, but common A1c cut off of 7% should be reconsidered due to dose-response relationship between glycemic control and infection</li> </ul>

Yang L, Sun Y, Li G, Liu J. Is hemoglobin A1c and perioperative hyperglycemia predictive of periprosthetic joint infection following total joint arthroplasty?: A systematic review and meta-analysis. Medicine (Baltimore). 2017 Dec;96(51):e8805. doi: 10.1097/MD.0000000 00008805. PMID: 29390415; PMCID: PMC5758117.	analysis of studies considering HbA1C with a cut-off of 7% as uncontrolled, this association was no longer noticed (P = .50). All 5 studies that specifically assessed for SSI and perioperative hyperglycemia showed a significant association, which was usually attenuated after adjusting for covariates. Conclusion Inadequate glycemic control was associated with increased risk for SSI after TJA. However, the optimal HbA1C threshold remains contentious. Pooled data does not support the conventional 7% cut-off for risk stratification. Future studies should examine new markers for determining adequate glycemic control. Objective: This meta-analysis aims to determine whether hemoglobin A1c (HbA1c) and perioperative hyperglycemia are associated with the increased risk of periprosthetic joint infection following total knee and hip arthroplasty. Methods: A systematic search is performed in Medline (1966-October 2017), PubMed (1966-October 2017), Embase (1980-October 2017), ScienceDirect (1985- October 2017), and the Cochrane Library. Only high-quality studies are selected. A meta-analysis is performed using Stata 11.0 software. Results: Six retrospective studies including 26,901 patients meet the inclusion criteria. The present meta-analysis indicates that there are significant differences between groups in terms of perioperative random blood glucose level [weighted mean difference (WMD) = 2.365, 95% confidence interval (95% CI): 1.802-2.929, P = .000] and perioperative hemoglobin A1c level (WMD = 3.266, 95% CI: 2.858- 3.674, P = .000). No significant difference is found regarding body mass index (BMI) condition between groups (WMD = 0.027, 95% CI: -0.487 to 0.541, P = .919). Conclusion: The present meta-analysis shows that high HbA1c and perioperative hyperglycemia are associated with a higher risk of periprosthetic joint infection following total joint arthroplasty. Screening of HbA1c and perioperative blood	Systematic review of association of HbA1c and perioperative hyperglycemia with increased risk of joint infection – out of 6 studies spanning over 26,000 patients, there is a significant association of both HbA1c and perioperative hyperglycemia with infection following TJA – screening for both HbA1c and perop glucose should be performed
	following total joint arthroplasty. Screening of HbA1c and perioperative blood glucose is therefore an effective method to predict deep infection.	
Procedure Specific:		
Hernia Repair	The second s	Determine effective direction of the state
won EJ, Lehman EB,	Importance: Patients with medically complex conditions undergoing repair of	Retrospective medical record review to
Geletzke AK, Tangel	large or recurrent hernia of the abdominal wall are at risk for early postoperative	evaluate association of postoperative serum
MR, Matsushima K,	hyperglycemia, which may serve as an early warning for delays in recovery and for	glucose level and complications/outcomes
Brunke-Reese D, Pichardo-Lowden AR,	adverse outcomes.	such as length of stay, costs of hospitalization, insulin administration, surgical site

Pauli EM, Soybel DI.	Objective: To evaluate postoperative serum glucose level as a predictor of	complications> almost half of patients that
Association of	outcome after open ventral hernia repair in patients with major medical	required insulin postoperatively did not
postoperative	comorbidities.	previously have diabetes mellitus, but most
hyperglycemia with		had at least one risk factor for prediabetic
outcomes among	Design, setting, and participants: We performed a retrospective medical record	condition.
patients with complex	review of 172 consecutive patients who underwent open ventral hernia repair at	
ventral hernia repair.	Penn State Milton S. Hershev Medical Center, an academic tertiary referral center.	
IAMA Surg. 2015	from May 1, 2011, through November 30, 2013. We initially identified patients by	
May:150(5):433-40.	medical complexity and repair requiring a length of stay of longer than 1 day.	
doi:		
10 1001/jamasurg 2014	Main outcomes and measures: Postoperative recovery variables including time to	
3160 PMID	the first solid meal length of stay, total costs of hospitalization, and surgical site	
25796099		
23780088.		
	Posulta: Postonorativo corum glucoso valuos waro available for 126 nationts	
	(70.1%) with 120 (05.6%) obtained within 48 hours of surgery Among these	
	(79.1%), with 150 (95.0%) obtained within 48 hours of surgery. Among these	
	patients, ventral Hernia Working Group grade distributions included 8 patients	
	with grade 1, 79 with grade 2, 41 with grade 3, and 8 with grade 4. Fifty-four	
	patients (39.7%) had a postoperative glucose level of at least 140 mg/dL, and 69	
	patients (50.7%) required insulin administration. Both outcomes were associated	
	with delays in the interval to the first solid meal (glucose level, $\geq$ 140 vs <140	
	$mg/dL$ : mean [SD] delay, 6.4 [5.3] vs 5.6 [8.2] days; P = .01; $\ge$ 2 insulin events vs <2:	
	6.5 [5.5] vs 5.4 [8.4] days; P = .02); increased length of stay (glucose level, $\geq$ 140 vs	
	<140 mg/dL: mean [SD], 8.0 [6.0] vs 6.9 [8.2] days; P = .008; ≥2 insulin events vs	
	<2: 8.3 [6.1] vs 6.5 [8.4] days; P < .001); increased costs of hospitalization (glucose	
	level, ≥140 vs <140 mg/dL: mean [SD], \$31 307 [\$20 875] vs \$22 508 [\$22 531]; P	
	<.001; ≥2 insulin events vs <2: \$31 943 [\$22 224] vs \$20 651 [\$20 917]; P < .001);	
	and possibly increased likelihood of surgical site occurrence (glucose level, ≥140 vs	
	<140 mg/dL: 37.5% [21 of 56 patients] vs 22.5% [18 of 80 patients]; P = .06; ≥2	
	insulin events vs <2: 36.4% [24 of 66 patients] vs 21.4% [15 of 70 patients]; P =	
	.06). Not all patients with diabetes mellitus developed postoperative	
	hyperglycemia or needed more intense insulin therapy; however, 46.4% of the	
	patients who developed postoperative hyperglycemia were not previously known	
	to have diabetes mellitus, although most had at least 1 clinical risk factor for a	
	prediabetic condition.	
	Conclusions and relevance: Postoperative hyperglycemia was associated with	
	outcomes in patients in this study who underwent complex ventral hernia repair	

	and may serve as a suitable target for screening, benchmarking, and intervention	
	in patient groups with major comorbidities.	
Quiroga-Centeno AC,	Background: Surgical Mesh Infection (SMI) after Abdominal Wall Hernia Repair	Systematic review and meta-analysis of risk
Quiroga-Centeno CA,	(AWHR) represents a catastrophic complication. We performed a systematic	factors for infection following abdominal wall
Guerrero-Macías S,	review and meta-analysis to analyze the risk factors for SMI in the context of	hernia repair – out of 23 studies evaluated,
Navas-Quintero O,	AWHR.	significant risk factors included T2DM, obesity,
Gómez-Ochoa SA.		ASA III/IV, among others.
Systematic review and	Methods: PubMed, Embase, Scielo, and LILACS were searched without language	
meta-analysis of risk	or time restrictions from inception until June 2021. Articles evaluating the	
factors for Mesh	association between demographic, clinical, laboratory and surgical characteristics	
infection following	with SMI in AWHR were included.	
Abdominal Wall Hernia		
Repair Surgery. Am J	Results: 23 studies were evaluated, comprising a total of 118,790 patients (98%	
Surg. 2022 Jul;224(1 Pt	males; mean age 56.5 years) with a mesh infection pooled prevalence of 4%.	
A):239-246. doi:	Significant risk factors for SMI were type 2 diabetes mellitus, obesity, smoking	
10.1016/j.amjsurg.2021	history, steroids use, ASA III/IV, laparotomy vs laparoscopy, emergency surgery,	
.12.024. Epub 2021 Dec	duration of surgery and onlay mesh position vs sublay. The quality of evidence was	
24. PMID: 34969506.	regarded as very low-moderate.	
	Conclusion: Several factors, highlighting sociodemographic characteristics,	
	comorbidities, and the clinical scenario, may increase the risk of developing mesh	
	infections in AWHR. The recognition and mitigation of these may significantly	
	reduce mesh infection rates in this context.	
Qin W, Huang X, Yang	Background: Diabetes mellitus (DM) is a common disease that has an adverse	Systematic review to evaluate influence of
H, Shen M <b>. The</b>	impact on most orthopedic surgeries, and its prevalence has gradually increased	diabetes mellitus on comorbidities and
Influence of Diabetes	in recent years. We aim to investigate the influence of DM on comorbidities and	complications of patients undergoing primary
Mellitus on Patients	complications of patients undergoing primary total lower extremity arthroplasty.	total lower extremity arthroplasty (THA, TKA)
Undergoing Primary		
Total Lower Extremity	Methods: PubMed, Embase, Cochrane Library, Medline, and Web of Science were	23 studies included, total >1.5 million patients
Arthroplasty: A	systematically searched for relevant studies published before December 2019.	with and without diabetes included in meta-
Systematic Review and	Demographic data, comorbidities, and postoperative complications after primary	analysis.
Meta-Analysis. Biomed	total hip arthroplasties (THA) or primary total knee arthroplasties (TKA) were	
Res Int. 2020 Dec	assessed between DM and non-DM patients. Meta-analysis was conducted using	Patient's with diabetes had higher rates of
15;2020:6661691. doi:	Review Manager 5.3, and forest plots were drawn for each variable.	complications (superficial and deep infection,
10.1155/2020/6661691		DVT, in-hospital mortality) compared to
. PMID: 33490250;	Results: A total of 1,560,461 patients (215,916 patients with DM and 1,344,545	patients without DM
PMCID: PMC7787736.	patients without DM) from 23 studies were included in this meta-analysis. The	
	incidences of several preoperative comorbidities (hypertension (HTN), kidney	

	disease, cardiac and cerebrovascular disease) were generally higher in patients with DM. Moreover, DM patients had a higher rate of postoperative complications (superficial and deep infection, deep vein thrombosis (DVT), and in-hospital mortality) compared to non-DM patients.	Controlling hyperglycemia in the perioperative period could reduce the rate of infection in patients undergoing THA/TKA – citation below
	Conclusions: DM patients were more likely to suffer from comorbidities and had a higher risk of complications in total lower extremity arthroplasty compared to non-DM patients. It is necessary to identify DM and control hyperglycemia in the perioperative period to prevent postoperative complications in patients with DM.	
Agos F, Shoda C, Bransford D. Part II: managing perioperative hyperglycemia in total hip and knee replacement surgeries. Nurs Clin North Am. 2014 Sep;49(3):299- 308. doi: 10.1016/j.cnur.2014.05. 004. PMID: 25155530.	Perioperative hyperglycemia management is an important factor in reducing the risk of surgical site infections (SSIs) in all patients regardless of existing history of diabetes. Reduction of SSIs is one of the quality indicators reported by the National Healthcare Safety Networks of the Centers for Disease Control and Prevention (CDC). In 2009 and 2010, the orthopedic surgical unit had an increased number of SSIs above the CDC benchmark. This article describes the impact of an evidence-based practice standard for perioperative hyperglycemia management in the reduction of SSIs in patients having total hip and knee replacement surgery.	Reducing BG in perioperative period can reduce SSI
Procedure specific: breast procedures		
Vilar-Compte D, Alvarez de Iturbe I, Martín- Onraet A, Pérez- Amador M, Sánchez- Hernández C, Volkow P. Hyperglycemia as a risk	Background: The aim of this study was to evaluate the association between perioperative hyperglycemia and surgical site infections (SSIs) in patients undergoing mastectomy. Methods: In this nested case-control study, patients undergoing mastectomy from May 2004 to June 2006, at the National Cancer Institute (INCan), Mexico, were	
factor for surgical site infections in patients undergoing mastectomy Am I	included. Five blood glucose values were obtained for each patient. Patients were followed prospectively by direct observation for at least 30 days. Results: A total of 260 patients were included. Patient characteristics were similar	
Infect Control. 2008 Apr;36(3):192-8. doi: 10.1016/j.ajic.2007.06. 003. PMID: 18371515.	in cases and controls. Cases were older (>50 years) (P = .001) and were more frequently treated with concomitant chemoradiation (P < .0001) than controls. Fifty cases (23.8%) developed an SSI. At least 1 measurement of blood glucose value > or = 150 mg/dL increased the risk for SSI (odds ratio [OR] = 3.05; 95% confidence interval [CI] = 1.5 to 6.3; P = .006). Variables associated with SSI after logistic regression analysis included age >50 years (OR = 3.7; 95% CI = 1.5 to 9.2; P	

	= .005), preoperative concomitant chemoradiation treatment (OR = 2.8; 95% CI = 1.4 to 5.8, P = .0004), and any blood glucose value > or = 150 mg/dL (OR = 2.9, 95% CI = 1.2 to 6.2; P = .02).	
	Conclusion: Postoperative SSI was a very frequent complication in this cohort. Our data indicate that higher blood glucose values are an independent risk factor for postoperative SSI. Preoperative concomitant chemoradiation and age > 50 years were also risk factors for developing an SSI in patients undergoing mastectomy.	
CGM		
CGM Martens T, Beck RW, Bailey R, et al. Effect of Continuous Glucose Monitoring on Glycemic Control in Patients With Type 2 Diabetes Treated With Basal Insulin: A Randomized Clinical Trial. JAMA. 2021;325(22):2262– 2272. doi:10.1001/jama.2021 .7444	<ul> <li>Importance Continuous glucose monitoring (CGM) has been shown to be beneficial for adults with type 2 diabetes using intensive insulin therapy, but its use in type 2 diabetes treated with basal insulin without prandial insulin has not been well studied.</li> <li>Objective To determine the effectiveness of CGM in adults with type 2 diabetes treated with basal insulin without prandial insulin in primary care practices.</li> <li>Design, Setting, and Participants This randomized clinical trial was conducted at 15 centers in the US (enrollment from July 30, 2018, to October 30, 2019; follow-up completed July 7, 2020) and included adults with type 2 diabetes receiving their diabetes care from a primary care clinician and treated with 1 or 2 daily injections of long- or intermediate-acting basal insulin without prandial insulin, with or without noninsulin glucose-lowering medications.</li> <li>Interventions Random assignment 2:1 to CGM (n = 116) or traditional blood glucose meter (BGM) monitoring (n = 59).</li> <li>Main Outcomes and Measures The primary outcome was hemoglobin A1c (HbA1c) level at 8 months. Key secondary outcomes were CGM-measured time in target glucose range of 70 to 180 mg/dL, time with glucose level at greater than 250 mg/dL, and mean glucose level at 8 months.</li> <li>Results Among 175 randomized participants (mean [SD] age, 57 [9] years; 88 women [50%]: 92 racial/ethnic minority individuals [53%]: mean [SD] haseline</li> </ul>	Findings In a randomized clinical trial including 175 adults with type 2 diabetes, there was a significantly greater decrease in HbA1c level over 8 months with continuous glucose monitoring than with blood glucose meter monitoring (-1.1% vs -0.6%). Meaning Continuous glucose monitoring resulted in better glycemic control compared with blood glucose meter monitoring in adults with poorly controlled type 2 diabetes treated with basal insulin without prandial insulin.
	HbA1c level, 9.1% [0.9%]), 165 (94%) completed the trial. Mean HbA1c level decreased from 9.1% at baseline to 8.0% at 8 months in the CGM group and from 9.0% to 8.4% in the BGM group (adjusted difference, $-0.4\%$ [95% CI, $-0.8\%$ to $-0.1\%$ ]; P = .02). In the CGM group, compared with the BGM group, the mean	

	percentage of CGM-measured time in the target glucose range of 70 to 180 mg/dL	
	was 59% vs 43% (adjusted difference, 15% [95% Cl, 8% to 23%]; P < .001), the	
	mean percentage of time at greater than 250 mg/dL was 11% vs 27% (adjusted	
	difference, $-16\%$ [95% CI, $-21\%$ to $-11\%$ ]; P < .001), and the means of the mean	
	glucose values were 179 mg/dL vs 206 mg/dL (adjusted difference, –26 mg/dL	
	[95% CI, −41 to −12]; P < .001). Severe hypoglycemic events occurred in 1	
	participant (1%) in the CGM group and in 1 (2%) in the BGM group.	
	Conclusions and Relevance Among adults with poorly controlled type 2 diabetes	
	treated with basal insulin without prandial insulin, continuous glucose monitoring,	
	as compared with blood glucose meter monitoring, resulted in significantly lower	
	HbA1c levels at 8 months.	
Marcus Lind, Arndís F.	OBJECTIVE	HgA1c lowered over several years for peoplele
Ólafsdóttir, Irl B. Hirsch,	Continuous glucose monitoring (CGM) reduces HbA1c and time spent in	with Typ1 diabetes using MG
Jan Bolinder, Sofia	hypoglycemia in people with type 1 diabetes (T1D) treated with multiple daily	
Dahlqvist, Aldina	insulin injections (MDI) when evaluated over shorter time periods. It is unclear to	
Pivodic, Jarl Hellman,	what extent CGM improves and helps to maintain glucose control, treatment	
Magnus Wijkman, Erik	satisfaction, diabetes distress, hypoglycemic concerns, and overall well-being over	
Schwarcz, Henrik	longer periods of time.	
Albrektsson, Tim Heise,		
William Polonsky;	RESEARCH DESIGN AND METHODS	
Sustained Intensive	The GOLD trial was a randomized crossover trial performed over 16 months of	
Treatment and Long-	CGM treatment in people with T1D treated with MDI. People completing the trial	
term Effects on HbA1c	(n = 141) were invited to participate in the current SILVER extension study in which	
Reduction (SILVER	107 patients continued CGM treatment over 1 year along with the support of a	
Study) by CGM in	diabetes nurse every 3 months.	
People With Type 1		
Diabetes Treated With	RESULTS	
MDI. Diabetes Care 1	The primary end point of the change in HbA1c over 1.0–1.5 years of CGM use	
January 2021; 44 (1):	compared with previous self-monitoring of blood glucose during GOLD showed a	
141–149.	decrease in HbA1c of 0.35% (95% CI 0.19–0.50, P < 0.001). Time spent in	
https://doi.org/10.2337	hypoglycemia <3.0 mmol/L (54 mg/dL) and <4.0 mmol/L (72 mg/dL) decreased	
/dc20-1468	from 2.1% to 0.6% (P < 0.001) and from 5.4% to 2.9% (P < 0.001), respectively.	
	Overall well-being (World Health Organization 5-item well-being index, P = 0.009),	
	treatment satisfaction (Diabetes Treatment Satisfaction Questionnaire, P < 0.001),	
	and hypoglycemic confidence (P < 0.001) increased, while hypoglycemic fear	
	(Hypoglycemia Fear Survey–Worry, P = 0.016) decreased and diabetes distress	
	tended to decrease (Problem Areas in Diabetes Scale, P = 0.06). From	

Cohen, D., Chan, M. L., Hassan, A. Y., Lei, A., Lacomb, J. F., Kravets, I., & Nicholson, J. (2023-2024). Perioperative Continuous Glucose Monitoring in Diabetic Patients Undergoing Primary Total Joint Arthroplasty. Stony Brook Medicine Journal of Scholarship, Innovation, and Quality Improvement - Orthopaedics, 18, 20- 24. https://renaissance.sto nybrookmedicine.edu/s ites/default/files/2024- 07/Cohen%20Glucose% 20Monitoting.pdf	randomization and screening in GOLD, HbA1c was lowered by 0.45% (P < 0.001) and 0.68% (P < 0.001) after 2.3 and 2.5 years, respectively. CONCLUSIONS The SILVER study supports beneficial long-term effects from CGM on HbA1c, hypoglycemia, treatment satisfaction, well-being, and hypoglycemic confidence in people with T1D managed with MDI. evaluate perioperative blood glucose control in patients with type 2 DM by CGM. We will evaluate the correlation between CGM data and preoperative HbA1c to determine if chronically poor blood glucose control is born out in the perioperative period. Preoperative hyperglycemia did not directly correlated with preoperative HgA1c, meaning there could be additional value to adding CGM as a preoperative instrument for patients with controlled or uncontrolled diabetes. "It is possible that preoperative application of CGMs may be an effective adjuvant screening tool that, when combined with HbA1c, could better evaluate a patient's risk of adverse outcomes." even patients with low-normal HbA1c may experience prolonged hyperglycemic episodes increasing their susceptibility to adverse events.	prospective clinical cohort study with a single surgeon conducted from October 2022 to February 2024 30 patients enrolled in study, mean HgA1c was 6.68, SD 0.77; The CGM was applied 3-4 days prior to surgery and continued for 10 days to the patients' abdomen, and a second sensor was applied immediately postoperatively. The glucose level was continuously measured with a value transmitted every 5 minutes "In fact, we found no correlation between the % hyperglycemia time and preoperative HbA1c in any time-period. This means that patients that we previously would have identified as low risk for infection on the basis of HbA1c alone may be misclassified." "It is possible that preoperative application of CGMs may be an effective adjuvant screening tool that, when combined with HbA1c, could better evaluate a patient's risk of adverse
Zowonioting.pur		tool that, when combined with HbA1c, could better evaluate a patient's risk of adverse outcomes."
Procedure Specific: Gastrointestinal		
Jones CE, Graham I A	Importance: Preoperative hyperglycemia is associated with adverse postoperative	Postoperative hyperglycemia 48 hours after
Morris MS, Richman JS,	outcomes among patients who undergo surgery. Whether preoperative	gastrointestinal surgery was associated with

Hollis RH, Wahl TS,	hemoglobin A1c (HbA1c) or postoperative glucose levels are more useful in	increased readmission, but elevated preop
Itani KMF, Hawn MT.	predicting adverse events following surgery is uncertain in the current literature.	HDAIC >6.5% was not. However, higher HDAIC was also associated with increased
Association Between	Objective: To examine the use of preoperative HbA1c and early postoperative	postoperative glucose checks and insulin use,
Preoperative	glucose levels for predicting postoperative complications and readmission.	meaning that treating postoperative
Hemoglobin A1c Levels,		hyperglycemia could explain the difference.
Postoperative	Design, setting, and participants: In this observational cohort study, inpatient	
Hyperglycemia, and	gastrointestinal surgical procedures performed at 117 Veterans Affairs hospitals	
Readmissions Following	from 2007 to 2014 were identified, and cases of known infection within 3 days	
Gastrointestinal	before surgery were excluded. Preoperative HbA1c levels were examined as a	
Surgery. JAMA Surg.	continuous and categorical variable (<5.7%, 5.7%-6.5%, and >6.5%). A logistic	
2017 Nov	regression modeled postoperative complications and readmissions with the	
1;152(11):1031-1038.	closest preoperative HbA1c within 90 days and the highest postoperative glucose	
doi:	levels within 48 hours of undergoing surgery.	
10.1001/jamasurg.2017		
.2350. Erratum in:	Main outcomes and measures: Postoperative complications and 30-day	
JAMA Surg. 2018 Aug	unplanned readmission following discharge.	
1;153(8):/82. doi:		
10.1001/jamasurg.2018	Results: Of 21 541 participants, 1193 (5.5%) were women, and the mean (SD) age	
.1905. PIVIID:	was 63.7 (10.6) years. The conort included 23 094 operations with measurements	
28/46/06; PIVICID:	of preoperative HDALC levels and postoperative glucose levels. The complication	
PIVIC5710419.	and 30-day readmission rates were 27.2% and 14.7%, respectively. In logistic	
	regression models adjusting for HDATC, postoperative glucose levels,	
	postoperative insulin use, diabetes, body mass index (calculated as weight in kilograms divided by beight in meters squared) and other patient and procedural	
	factors, neak postoperative glucose levels of more than 250 mg/dL were	
	associated with increased 30-day readmissions (odds ratio 1 18: 95% CL 0 99-	
	1.41: P = 0.7) By contrast, a preoperative HbA1c of more than 6.5% was	
	associated with decreased 30-day readmissions (odds ratio 0.85: 95% CL 0.74-	
	0.96· P = 01) As preoperative HbA1c increased the frequency of 48-hour	
	postoperative glucose checks increased (4.92, 6.89, and 9.71 for an HbA1c <5.7%.	
	5.7%-6.4%, and >6.5%, respectively: P < .001). Patients with a preoperative HbA1c	
	of more than 6.5% had lower thresholds for postoperative insulin use.	
	Conclusions and relevance: Early postonerative hyperglycemia was associated	
	with increased readmission, but elevated preoperative Hybridity Hhblic was not $\Delta$ higher	
	preoperative HbA1c was associated with increased postoperative glucose level	
	properative his the was associated with mercused postoperative Blacose level	

	checks and insulin use, suggesting that heightened postoperative vigilance and a	
	lower threshold to treat hyperglycemia may explain this finding.	
Carlsson CJ, Nørgaard	Objective: To investigate the frequency and duration of hypo- and hyperglycemia,	Found patients with prolonged hypo and
K, Oxbøll AB, Søgaard	assessed by continuous glucose monitoring (CGM) during and after major surgery,	hyperglycemic events were more likely to
MIV, Achiam MP,	in departments with implemented diabetes care protocols.	experience adverse outcomes, especially
Jørgensen LN, Eiberg JP,		those with diabetes.
Palm H, Sørensen HBD,	Summary background data: Inadequate glycemic control in the perioperative	
Meyhof CS, Aasvang EK.	period is associated with serious adverse events, but monitoring currently relies	
Continuous Glucose	on point blood glucose measurements, which may underreport glucose	
Monitoring Reveals	excursions.	
Perioperative		
Hypoglycemia in Most	Methods: Adult patients without (A) or with diabetes [non-insulin-treated type 2	
Patients With Diabetes	(B), insulin-treated type 2 (C) or type 1 (D)] undergoing major surgery were	
Undergoing Major	monitored using CGM (Dexcom G6), with an electrochemical sensor in the	
Surgery: A Prospective	interstitial fluid, during surgery and for up to 10 days postoperatively. Patients and	
Cohort Study. Ann Surg.	health care staff were blinded to CGM values, and glucose management adhered	
2023 Apr 1;277(4):603-	to the standard diabetes care protocol. Thirty-day postoperative serious adverse	
611. doi:	events were recorded. The primary outcome was duration of hypoglycemia	
10.1097/SLA.00000000	(glucose <70 mg/dL). Clinicaltrials.gov: NCT04473001.	
00005246. Epub 2021		
Oct 8. PMID: 35129526.	Results: Seventy patients were included, with a median observation time of 4.0	
	days. CGM was recorded in median 96% of the observation time. The median daily	
	duration of hypoglycemia was 2.5 minutes without significant difference between	
	the 4 groups (A-D). Hypoglycemic events lasting ≥15 minutes occurred in 43% of	
	all patients and 70% of patients with type 1 diabetes. Patients with type 1	
	diabetes spent a median of 40% of the monitoring time in the normoglycemic	
	range 70 to 180 mg/dL and 27% in the hyperglycemic range >250 mg/dL. Duration	
	of preceding hypo- and hyperglycemia tended to be longer in patients with serious	
	adverse events, compared with patients without events, but these were	
	exploratory analyses.	
	Conclusions: Significant duration of both hypo- and hyperglycemia was detected in	
	high proportions of patients, particularly in patients with diabetes, despite	
	protocolized perioperative diabetes management.	
Krutkyte G, Goerg AMC,	Objective:	Population: age >18 years, planned procedure
Grob CA, Piazza CD,	To assess the efficacy and safety of fully closed-loop (FCL) compared with usual	abdominal surgery for >/= 90 minutes. Most
Rolfes ED, Gloor B,	care (UC) glucose control in patients experiencing major abdominal surgery-	patients were male, predominantly
Wenning AS, Beldi G,	related stress hyperglycemia.	undergoing pancreatic surgery.

Kollmar O, Hovorka R, Wilinska ME, Herzig D, Vogt AP, Girard T, Bally L. Perioperative Fully Closed-loop Versus Usual Care Glucose Management in Adults Undergoing Major Abdominal Surgery: A Two-centre Randomized Controlled Trial. Ann Surg. 2025 May 1;281(5):732-740. doi: 10.1097/SLA.0000000 00006549. Epub 2024 Sep 30. PMID: 39348314; PMCID: PMC11974617.	<ul> <li>Background: Major abdominal surgery-related stress and periprocedural interventions predispose to perioperative hyperglycemia, both in diabetes and non-diabetes patients. Insulin corrects hyperglycemia effectively, but its safe use remains challenging.</li> <li>Methods: In this two-centre randomized controlled trial, we contrasted subcutaneous FCL with UC glucose management in patients undergoing major abdominal surgery anticipated to experience prolonged hyperglycemia. FCL (CamAPS HX, Dexcom G6, mylife YpsoPump 1.5x) or UC treatment was used from hospital admission to discharge (max 20 d). Glucose control was assessed using continuous glucose monitoring (masked in the UC group). The primary outcome was the proportion of time with sensor glucose values in a target range of 5.6 to 10.0 mmol/L.</li> <li>Results:</li> <li>Thirty-seven surgical patients (54% pancreas, 22% liver, 19% upper gastrointestinal, 5% lower gastrointestinal), of whom 18 received FCL and 19 UC glucose management, were included in the analysis. The mean ± SD percentage time with sensor glucose in the target range was 80.1% ± 10.0% in the FCL and 53.7% ± 19.7% in the UC group (P &lt; 0.001). Mean glucose was 7.5 ± 0.5 mmol/L in the FCL and 9.1 ± 2.4 mmol/L in the UC group (P = 0.015). Time in hypoglycemia (&lt;3.0 mmol/L) was low in either group. No study-related serious adverse events occurred.</li> <li>Conclusions:</li> <li>The FCL approach resulted in significantly better glycemic control compared with UC management, without increasing the risk of hypoglycemia. Automated glucose-responsive insulin delivery is a safe and effective strategy to minimize hyperglycemia in complex surgical populations.</li> </ul>	<ul> <li>RCT of 38 patients.</li> <li>Those on parenteral nutrition had a stronger dose-response relationships between hyperglycemia and complications – tighter glucose control may be necessary for those on parenteral nutrition</li> <li>Clinical inertia still exists for those not patients without diabetes</li> <li>The closed loop system for insulin pumps is only as good as the CGM used to understand glucose – CGM seems to be mostly accurate (specific Dexcom macihine) for preop and postop periods but not intraop, especially for certain procedures including major cardiac surgery where circulation is compromised/changed</li> </ul>
	hyperglycemia in complex surgical populations.	
Clarke Z, Fricka K, Chen AF, Ast MP, Sporer SM, Springer BD. Patient Preoperative Optimization: How to Do It and How to Be Paid for the Work. J		

Arthroplasty. 2025 Apr 19:S0883- 5403(25)00377-8. doi: 10.1016/j.arth.2025.04. 040. Epub ahead of print. PMID: 40258501. https://pubmed.ncbi.nl m.nih.gov/40258501/		
Prevalence of Diabetes with Risk Factors		
K.M.V. Narayan, James P. Boyle, Theodore J. Thompson, Edward W. Gregg, David F. Williamson; Effect of BMI on Lifetime Risk for Diabetes in the U.S Diabetes Care 1 June 2007; 30 (6): 1562– 1566. https://doi.org/10.2337 /dc06-2544	OBJECTIVE—At birth, the lifetime risk of developing diabetes is one in three, but lifetime risks across BMI categories are unknown. We estimated BMI-specific lifetime diabetes risk in the U.S. for age-, sex-, and ethnicity-specific subgroups. RESEARCH DESIGN AND METHODS—National Health Interview Survey data (n = 780,694, 1997–2004) were used to estimate age-, race-, sex-, and BMI-specific prevalence and incidence of diabetes in 2004. U.S. Census Bureau age-, race-, and sex-specific population and mortality rate estimates for 2004 were combined with two previous studies of mortality to estimate diabetes- and BMI-specific mortality rates. These estimates were used in a Markov model to project lifetime risk of diagnosed diabetes by baseline age, race, sex, and BMI. RESULTS—Lifetime diabetes risk at 18 years of age increased from 7.6 to 70.3% between underweight and very obese men and from 12.2 to 74.4% for women. The lifetime risk difference was lower at older ages. At 65 years of age, compared with normal-weight male subjects, lifetime risk differences (percent) increased from 3.7 to 23.9 percentage points between overweight and very obese men and from 8.7 to 26.7 percentage points for women. The impact of BMI on diabetes duration also decreased with age.	At 18 years of age, Lifetime risk for diabetes increases with baseline BMI in both sexes regardless of age. Lifetime risk of diabetes is most strongly associated with BMI >/= 30 kg/m2.
Centers for Disease	Among the U.S. population overall, crude estimates for 2021 were:	Percentage of adults with diabetes increases
Control and Prevention.		with age $-29.2\%$ among those aged 65+
(n.d.). Data & research	38.4 million people of all ages—or 11.6% of the U.S. population—had diabetes.	Incidence of diabetes increased from 4.8% in
on diabetes. U.S. Department of Health	38.1 million adults aged 18 years or older—or 14.7% of all U.S. adults—had diabetes (Table 1a; Table 1b).	18-44 year olds to 18.9% in 45-64 year olds

and Human Services.	8.7 million adults aged 18 years or older who met laboratory criteria for diabetes	
Retrieved April 28,	were not aware of or did not report having diabetes (undiagnosed diabetes, Table	
2025, from	1b). This number represents 3.4% of all U.S. adults (Table 1a) and 22.8% of all U.S.	
https://www.cdc.gov/di	adults with diabetes.	
abetes/php/data-	The percentage of adults with diabetes increased with age, reaching 29.2% among	
research/index.html	those aged 65 years or older (Table 1a).	
Rodolfo Valdez, Paula	OBJECTIVE—We sought to test the association between stratified levels of familial	Familial risk was graded along a spectrum of
W. Yoon, Tiebin	risk of diabetes and the prevalence of the disease in the U.S. population.	average, moderate or high. High – at least 2
Liu, Muin J. Khoury;		first degree relatives or one first degree
Family History and	RESEARCH DESIGN AND METHODS—This study includes 16,388 adults interviewed	relative and 2 second degree relatives with
Prevalence of Diabetes	for the National Health and Nutrition Examination Survey between 1999 and	diabetes from the same lineage. Moderate – 1
in the U.S.	2004. Fasting glucose was available for a subsample of 6,004 participants. Familial	first degree and 1 second degree relative, or
Population: The 6-year	risk of diabetes was classified as average, moderate, or high. The prevalence and	only 1 first degree, or 2 second degree relative
results from the	the odds of having diabetes were estimated for each risk class after accounting for	with diabetes from same maternal or paternal
National Health and	other risk factors.	line. Average – no family history of diabetes or
Nutrition Examination		at most 1 second degree relative.
Survey (1999–	RESULTS—Overall, 69.8% of the U.S. adults were in the average, 22.7% in the	
2004). Diabetes Care 1	moderate, and 7.5% in the high familial risk for diabetes. The crude prevalence of	Odds of having diabetes for people in
October 2007; 30 (10):	diabetes for each risk class was 5.9, 14.8, and 30%, respectively. The graded	moderate and high familial risk categories
2517–	association between familial risk and prevalence of diabetes remained even after	were respectively 2.3 and 54.5 times higher
2522. <u>https://doi.org/1</u>	accounting for sex, race/ethnicity, age, BMI, hypertension, income, and education.	
<u>0.2337/dc07-0720</u>	Versus people in the average risk class, independently of other risk factors	
	considered, the odds of having diabetes for people in the moderate and high	
	familial risk categories were, respectively, 2.3 and 5.5 times higher.	
	CONCLUSIONS—In the U.S. population, family history of diabetes has a significant,	
	independent, and graded association with the prevalence of diabetes. This	
	association not only highlights the importance of shared genes and environment	
	in diabetes but also opens the possibility of formally adding family history to	
	public health strategies aimed at detecting and preventing the disease.	
Zobair M. Younossi,	The prevalence of nonalcoholic fatty liver disease (NAFLD) in the United States is	Incidence of NAFLD among people with type 2
Linda Henry;	38%, having increased by 50% within the past 3 decades. The estimated NAFLD	diabetes is estimated to be more than 50%.
Understanding the	prevalence among people with type 2 diabetes is 55–70%. The presence of type 2	Incidence of NAFLD is three times higher in
Burden of Nonalcoholic	diabetes is associated with a higher likelihood of progression of NAFLD to fibrosis	people with overweight/obesity compared to
Fatty Liver Disease:	development, liver transplant, and death. Cardiovascular disease is the main	those of normal weight.
Time for Action.	cause of mortality among people with NAFLD, and the risk of death is significantly	
Diabetes Spectr 15	higher in people with both NAFLD and type 2 diabetes. NAFLD carries high patient	
February 2024; 37 (1):	and economic burdens but low awareness among both the general public and	

9–19.	health care providers. This article reviews the epidemiology of NAFLD and	
https://doi.org/10.2337	discusses the need for appropriate risk stratification, referral for specialty care,	
/dsi23-0010	management of cardiometabolic risk factors, and treatment of the disease. The	
	authors present a call to action to raise awareness of NAFLD and address its	
	increasing burden in a systematic and efficient manner.	
Mary V. Diaz-Santana,	OBJECTIVE	PMH of one or more pregnancy with GDM
Katie M. O'Brien, Yong-	Gestational diabetes mellitus complicates ~6% of pregnancies and strongly	increased risk of developing T2DM even after
Moon Mark Park, Dale	predicts subsequent type 2 diabetes. It has not been fully elucidated how risk	35 years post delivery, but most stark within
P. Sandler, Clarice R.	depends on the number of affected pregnancies or how long the excess risk	first 10 years after delivery. Increased risk of
Weinberg; Persistence	persists.	developing T2DM with more than one
of Risk for Type 2		pregnancy with GDM.
Diabetes After	RESEARCH DESIGN AND METHODS	
Gestational Diabetes	We assessed reproductive histories in relation to risk of type 2 diabetes using a	
Mellitus. Diabetes Care	nationwide cohort of 50,884 women. Among participants who initially did not	
1 April 2022; 45 (4):	have diabetes, 3,370 were diagnosed with diabetes during 10 years of follow-up.	
864–870.	We used Cox proportional hazards models that allowed risk to depend on age,	
https://doi.org/10.2337	cumulative number of pregnancies with gestational diabetes mellitus, and time	
/dc21-1430	since the most recent affected pregnancy, adjusting for BMI, educational level,	
	and race/ethnicity.	
	RESULTS	
	History of one or more pregnancies with gestational diabetes mellitus predicted	
	elevated age-specific risk of type 2 diabetes, with a hazard ratio of 3.87 (95% CI	
	2.60–5.75) 6–15 years after an affected pregnancy. Risk increased steeply with	
	multiple affected pregnancies. The age-specific associations attenuated over time	
	after an affected pregnancy, with an estimated 24% reduction of the hazard ratio	
	per decade. Risk remained elevated, however, for >35 years.	
	CONCLUSIONS	
	Gestational diabetes mellitus predicted markedly increased rates of type 2	
	diabetes. Relative risk increased substantially with each additional affected	
	pregnancy. The estimated hazard ratio declined with time after a pregnancy with	
	gestational diabetes mellitus but remained elevated for >35 years. Women	
	recalling a history of gestational diabetes mellitus should be screened regularly for	
	type 2 diabetes, even late in life.	