

Improved Clinical Pathway for Recognizing and Treating Diabetes in Hospitalized Patients

University Hospital Tübingen, Germany

While diabetes is recognized globally as a major healthcare epidemic, the true prevalence of diabetes is largely underrecognized within Germany. Patients that present with diabetic-related complications are often classified under other disease-related groups (DRGs) with higher reimbursement rates. Comorbidities, such as diabetes and/or hypertension, only marginally increase reimbursement, if any at all. As a result, reported hospitalization for diabetic-related presentations in Germany is substantially lower than expected. Out of an estimated 5-7 million people with diabetes in Germany, officially only 213,480 presented to the hospital in 2011, however, this number is estimated to be much higher.^{1,2} With treatment for diabetics predominantly associated with ambulatory care, <83% of German hospitals have no diabetes qualifications.² Of the 14% that have specialty centers within internal medicine focusing on metabolic diseases and diabetes, many are experiencing risks for funding. An integrated clinical care team at the University Hospital in Tübingen was formed to elevate the awareness of diabetes in German hospital settings including recognition of true prevalence for known and unknown cases, the distribution amongst the medical departments, as well as optimization of treatment pathways to maximize high-quality care. Leveraging HbA1c as a screening tool for all patients admitted to the hospital has led to the identification of 3.7% of all patients as previously undiagnosed diabetic, and implementation of targeted therapy and specialty consultations for patients at risk to improve outcomes and lower mean length of stay.³



PATIENT



CLINICIAN



HOSPITAL
ADMINISTRATION



PAYOR



The University Hospital Tübingen which is 1 of 33 university hospitals in Germany has been a long time partner and founding member of the German Center for Diabetes Research (DZD), a national association that brings together experts in the field of diabetes research and combines basic research, translational research, epidemiology, and clinical applications. With funding and support from the DZD, the Department of Diabetology and Endocrinology, Clinical Chemistry, and the Institute for Diabetes Research and Metabolic Diseases (IDM) of the Helmholtz Zentrum München at the University of Tübingen led groundbreaking research for effective medical treatment to the highest standard for diabetic patients.

KEY PARTNERS / STAKEHOLDERS



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SITUATION ANALYSIS

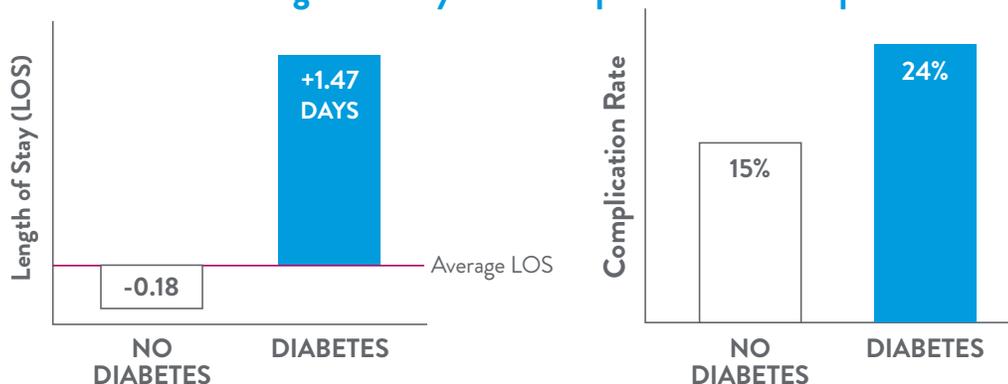
- Diabetes mellitus is a serious global health burden⁴
- Correct diagnosis of diabetes mellitus is crucial for adequate clinical treatment⁴
- Diabetic complications are associated with high costs, longer length of stay, and increased patient risks⁴
- Implementing evidence-based optimal treatment for patients with diabetes can lead to measurably better healthcare

OPTIMIZING CARE OF PATIENTS WITH PREDIABETES AND DIABETES

DISCOVERY

Hospitalized patients with diabetes and hyperglycemia have an increased risk of mortality, increased incidence of complications, increased length of stay, and increased costs per admission.⁷ Patients with diabetes are more often admitted to hospitals and the intensive care unit (ICU) and therefore require more infection management than people without diabetes.^{8,9,10} Unknown/undiagnosed diabetes is an additional risk factor for myocardial infarction and mortality, especially in ICU patients,¹¹ contributing to higher costs and longer hospital stays than those without diabetes.

Patient Length of Stay and Complications in Hospital



Adapted from Kufeldt J, Kovarova M, Adolph M, et al. Prevalence and Distribution of Diabetes Mellitus in a Maximum Care Hospital: Urgent Need for HbA1c-Screening. *Exp Clin Endocrinol Diabetes*. 2018;126(2):123-129. doi: 10.1055/s-0043-112653. Epub 2017 Jul 27.

HYPOTHESIS

The diagnosis of diabetes is underrecognized in the hospital. Implementation of screening pathways using HbA1c as a biomarker for checking the diabetic status of presenting patients can enhance detection, guide targeted therapy and improve patient and health system outcomes. HbA1c values are superior to static glucose levels as HbA1c reflects glycemic control for the preceding three months. Without the implementation of the screening algorithms with HbA1c, only 34% of patients with known diabetes had an active request for their HbA1c value during their hospital stay.³ We proposed that implementation of HbA1c screening in the central laboratory enables estimation of longer-term glucose control which is essential for adequate planning of therapeutic interventions and improved outcomes.

DIAGNOSIS ¹²	ACTION ⁷
Diabetes Mellitus HbA1c ≥ 6.5 % (48 mmol/mol)	ALERT: High-risk patient for hospital-acquired complications <ul style="list-style-type: none"> • Treatment to target, ensure glycemic targets, individualised treatment • Check secondary complications
Prediabetes	ALERT: Medium risk patient for hospital-acquired complications <ul style="list-style-type: none"> • Secondary complications • Prevention of progression
No Diabetes Mellitus HbA1c < 5.7 % (<39 mmol/mol)	No action

OPTIMIZING CARE OF PATIENTS WITH PREDIABETES AND DIABETES

SUCCESS FACTORS

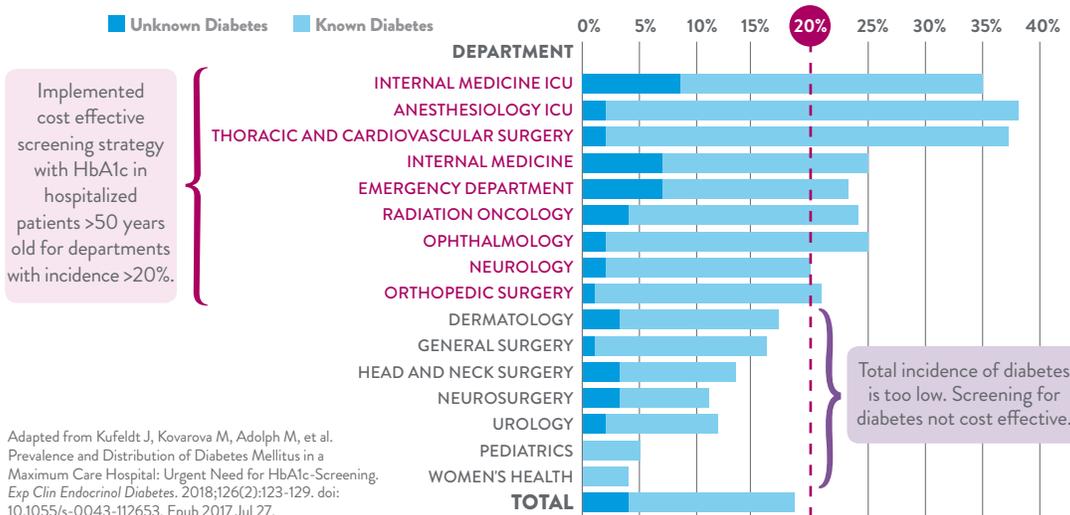
PARTNERS

The high incidence of diabetes in a maximum care hospital require a diabetology department to support optimal diabetes care. The interdependencies across secondary complications of diabetes require a multidisciplinary team to support optimal care for diabetes-related complication. The diabetes care team at University Hospital Tübingen includes diabetology, endocrinology, angiology, nephrology, surgery, stroke unit, ICU, gynecology, ophthalmology and laboratory medicine.

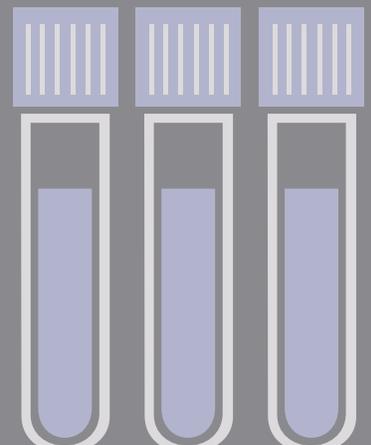
EXECUTION

The number of patients over 50 years of age that would need to be screened in order to detect one unknown case of diabetes at University Hospital Tübingen is 17 patients. This care team began implementation of their HbA1c screening program in hospital departments with the highest incidence of unknown diabetes (Internal Medicine ICU, Emergency Department, Internal Medicine) for the highest impact. Ultimately, screening of glycemic status was implemented for all hospitalized patients over 50 years of age in departments with a total incidence greater than 20%. HbA1c screening, however, regardless of age, has value for departments with the highest overall diabetes risk and incidence.

Total % Incidence Diabetes



- HbA1c is a preferred blood test for diagnosing and controlling diabetes mellitus⁵
- Strategies that employ HbA1c as a screening marker for detecting patients at risk for unknown diabetes mellitus are cost-effective and endorsed by guidelines⁶
- Integrated clinical care teams are essential to ensure interdisciplinary therapy for hospital patients with diabetes and/or related diseases
- Nationwide screening opportunities in hospital settings can standardize care and improve overall patient outcomes



PROOF OF VALUE

Identification of patient risk drives optimal treatment and patient pathways that guide care. Prevalence studies followed by corresponding testing pathways enables risk recognition and optimized treatment plans across specific populations.



1 in every 4 people presenting to the University Hospital Tübingen have known diabetes³

1 in every 4 people presenting to the University Hospital Tübingen have known prediabetes³

50% of people presenting to the University Hospital Tübingen have either diabetes or prediabetes

SPOTLIGHT ON STAKEHOLDER SUCCESS

 <p>PATIENT</p>	<p>IMPROVED PATIENT WELLNESS</p>	<p>7% of patients that present to the emergency department (ED) with formerly unrecognized diabetes can be identified, diagnosed and put into treatment programs</p> <p>“Early recognition of patients with diabetes not only improve patient outcomes but with tight continuous control can prevent long-term complications and improved quality of life.”</p> <p>–Andreas Fritsche, MD, Diabetology, Professor Internal Medicine, University Hospital Tübingen</p>
 <p>CLINICIAN</p>	<p>IMPROVED CLINICIAN CONFIDENCE</p>	<p>Survey findings* post-implementation of the care project at the University Hospital in Tübingen support the following:</p> <ul style="list-style-type: none"> • 100% of clinicians indicated that knowing patient’s glycemic status is important • 87% of clinicians surveyed felt knowing the HbA1c value increased their confidence of their decisions • 94% of clinicians surveyed felt knowing HbA1c value had a direct positive impact on treatment or triage of patients with the remaining 6% stating no impact. No responses stated that HbA1c had a negative impact. <p>“Continued support for the study of detection and management of diabetes, including continued funding for the specialty center at the University Hospital in Tübingen underscores our commitment and the importance of this disease. It makes me happy to be part of a leading institution in this area and implement laboratory diagnostics to improve patient care.”</p> <p>–Andreas Peter, MD, Professor of Clinical Chemistry and Laboratory Medicine, Head of Central Laboratory, University Hospital Tübingen</p>
 <p>HOSPITAL ADMINISTRATION</p>	<p>STRONG HOSPITAL REPUTATION</p>	<p>“Successful implementation of this clinical care project at University Hospital in Tübingen has inspired additional sites to implement similar screening programs.”</p> <p>–Professor Hans-Ulrich Häring, MD, Director of the IDM, Board member of the German Center for Diabetes Research</p> <p>Two German sites have already initiated HbA1c screening programs following the best practice at University Hospital in Tübingen</p>
 <p>PAYOR</p>	<p>REDUCED COSTS</p>	<p>“Long-term complications of diabetes involves substantial costs. Our diabetes care initiative helps to optimize treatment of patients with diabetes and prediabetes immediately upon presentation to the Emergency Department. While we are still collecting patient follow-up, we are confident that this program is associated with reduced costs, reduced complications, and reduced length of stay.”</p> <p>–Andreas Fritsche, MD, Diabetology, Professor Internal Medicine, University Hospital Tübingen</p>

*50 medical doctors across University Hospital Tübingen spanning 82% internal medicine, 4% pediatrics, 10% ICU/ED and 4% laboratory medicine. Feedback rate was 66%.

1. Bavarian Ministry of Health and Care. Bayerisches Staatsministerium für Gesundheit und Pflege: Bayerischer Diabetesbericht 2014. [https://www.bestellen.bayern.de/application/applstarter?APPL=eshop&DIR=eshop&ACTIONx:SETVAL\(artdtl.htm,APGx:NODENR:332601,AAARTxNR:stmgp_gesund_008,AAARTx:NODENR:332903,USERx:BODYURL:artdtl.htm,KATALOG:StMGP,AKATx:NAME:StMGP,ALLE:x\)=X](https://www.bestellen.bayern.de/application/applstarter?APPL=eshop&DIR=eshop&ACTIONx:SETVAL(artdtl.htm,APGx:NODENR:332601,AAARTxNR:stmgp_gesund_008,AAARTx:NODENR:332903,USERx:BODYURL:artdtl.htm,KATALOG:StMGP,AKATx:NAME:StMGP,ALLE:x)=X). Accessed April 30, 2018.
2. Fritsche A, DIABETES MELLITUS IN DER KLINIK Mehr Strukturen schaffen, Perspektiven der Diabetologie, Deutsches Ärzteblatt: 16-18, 2/2017.
3. Kufeldt J, Kovarova M, Adolph M, et al. Prevalence and Distribution of Diabetes Mellitus in a Maximum Care Hospital: Urgent Need for HbA1c-Screening. *Exp Clin Endocrinol Diabetes*. 2018;126(2):123-129. doi: 10.1055/s-0043-112653. Epub 2017 Jul 27.
4. World Health Organization 2016. Global Report on Diabetes. http://apps.who.int/iris/bitstream/handle/10665/204871/9789241565257_eng.pdf?sequence=1. Accessed May 1, 2018.
5. International Expert Committee. International Expert Committee report on the role of the A1C assay in the diagnosis of diabetes. *Diabetes Care*. 2009;32:1327-1334
6. Hoyer A, Rathmann W, Kuss O. Utility of HbA1c and fasting plasma glucose for screening of Type 2 diabetes: a meta-analysis of full ROC curves. *Diabet Med*. 2018;35(3):317-322.
7. Corsino L, Dhatariya K, Umpierrez G. Management of Diabetes and Hyperglycemia in Hospitalized Patients. Endotext Website. <https://www.ncbi.nlm.nih.gov/books/NBK279093/>. Updated October 1, 2017. Accessed April 19, 2018.
8. Köster I, et al. Per-capita costs of diabetes mellitus in Germany 2010. *Exp Clin Endocrinol Diabetes* 2014; 122: 510–516
9. Korbelt I, Spencer JD. Diabetes mellitus and infection: an evaluation of hospital utilization and management costs in the United States. *J Diabetes Complications*. 2014;29(2):192-195. doi: 10.1016/j.jdiacomp.2014.11.005.
10. Carpenter DL, Gregg SR, Xu K, et al. Prevalence and Impact of Unknown Diabetes in the ICU. *Crit Care Med*. 2015;43(12):e541-e550. doi: 10.1097/CCM.0000000000001353.
11. Giraldez RR, Clare RM, Lopes RD, et al. Prevalence and clinical outcomes of undiagnosed diabetes mellitus and prediabetes among patients with high-risk non-ST-segment elevation acute coronary syndrome. *Am Heart J*. 2013;165(6):918-925.e912. doi: 10.1016/j.ahj.2013.01.005. Epub 2013 Feb 13.
12. Nauck M, Petermann A, Müller-Wieland D, et al. Definition, classification and diagnosis of diabetes mellitus. *Diabetologie*. 2017;12(Suppl 2):S94-S100. doi: 10.1055/s-0043-115953.