

Implementation of a Novel Research Platform to Research New Academic Healthcare Professions at the Deggendorf Institute of Technology

Novel research platform for national healthcare profession research at the DIT

Kathrin Burgmaier^{1#}	Cornelia Hagl⁸	Sebastian Schwinger¹⁵
Antonia Hofmann¹	Claudia Heilmann⁹	Martin Starke¹⁵
Stefan Schönstein¹	Peter Heistermann⁹	Markus Witzmann¹⁶
Aida Anetsberger²	Andreas Hetey¹⁰	Markus Zimmermann¹⁷
Hendrik Bollen³	Katharina Larisch¹¹	Christian Rester^{1*}
Inge Eberl^{14,5}	Tanja Meyer¹²	Mathias Burgmaier^{1,14*}
Matthias Feyrer⁶	Marcus Plaschke¹³	
Robert Hable⁷	Florian Schuberth¹⁴	

<https://doi.org/10.25929/ql1zxt54>

ABSTRACT

More data on the academization of healthcare professions such as academically qualified nurse practitioners (NPs) and physician assistants (PAs) in Germany are urgently needed. Thus, a research platform that enables the assessment and evaluation of these new academically qualified healthcare professions regarding their effects on efficiency, cost-effectiveness and quality of patient care nationwide is necessary and depicted in this manuscript.

We now describe a novel research platform, which was implemented at the Deggendorf Institute of Technology (DIT) for nationwide research of novel healthcare

*shared last authorship

corresponding author

¹ Faculty of Applied Healthcare Sciences, Deggendorf Institute of Technology, Deggendorf;

² Fakultät Interdisziplinäre Studien, Hochschule für Angewandte Wissenschaften Landshut, Landshut;

³ The PA Company GmbH, Essen;

⁴ Fakultät für Soziale Arbeit, Katholische Universität Eichstätt-Ingolstadt, Eichstätt;

⁵ Institut für Pflegewissenschaft, LMU Klinikum München, München;

⁶ Department of Industrial Engineering and Health, Technical University of Applied Sciences Amberg-Weiden, Weiden;

⁷ Faculty of Applied Computer Science, Deggendorf Institute of Technology, Deggendorf;

⁸ Carl Remigius Medical School München, München;

⁹ German University Association Physician Assistant, Cologne;

¹⁰ Clinical Trial Office, Charité Universitätsmedizin Berlin, Berlin;

¹¹ CBS University of Applied Sciences Berlin, Berlin;

¹² CBS University of Applied Sciences Köln, Köln;

¹³ Kliniken am goldenen Steig, Freyung;

¹⁴ Allgemeinmedizin Schuberth und Kollegen, Deggendorf;

¹⁵ IT Centre, Deggendorf Institute of Technology, Deggendorf;

¹⁶ Faculty 11, Munich University of Applied Sciences, Munich;

¹⁷ Fachbereich Gesundheit, Hochschule Bielefeld, Bielefeld

professions. Following thorough evaluation of various research tools regarding data safety, feasibility and power, REDCap has been selected as part of this extensive platform for data acquisition and management. In addition, the platform is based on modules encompassing project-internal as well as external stakeholders and infrastructure, data management including ethical approval and statistics, as well as enrollment of study participants.

Hence, this new research platform including REDCap aims to characterize new healthcare professions regarding their effects and performance in the German healthcare system. In addition, this platform can be used as a role model for nationwide research also in natural and social sciences.

In Deutschland werden dringend mehr Daten zur Akademisierung von Gesundheitsberufen wie akademisch qualifizierten Nurse Practitioners (NPs) und Physician Assistants (PAs) benötigt. Daher ist eine Forschungsplattform erforderlich, die eine bundesweite Erhebung und Bewertung dieser neuen akademisch qualifizierten Gesundheitsberufe bezüglich ihrer Auswirkungen auf Effizienz, Kosteneffektivität, und Qualität der Patientenversorgung ermöglicht. Eine solche Plattform wird in diesem Manuskript dargestellt.

Wir beschreiben hier eine neue Forschungsplattform, die an der Technischen Hochschule Deggendorf zur bundesweiten Erforschung neuer Gesundheitsberufe implementiert wurde. Nach einer gründlichen Bewertung verschiedener Forschungssoftwaretools hinsichtlich Datensicherheit, Praktikabilität und Leistungsfähigkeit wurde schlussendlich REDCap als Bestandteil dieser umfassenden Plattform für die Datenerhebung und -verwaltung ausgewählt. Darüber hinaus basiert die Plattform auf Modulen, die projektinterne sowie externe Partner und Infrastruktur, Datenmanagement inklusive Ethikvotum und Statistik sowie die Rekrutierung von Studienteilnehmenden umfassen.

Daher zielt diese neue Forschungsplattform mit REDCap integriert darauf ab, neue Gesundheitsberufe hinsichtlich ihrer Auswirkungen und Leistungsfähigkeit im deutschen Gesundheitssystem zu charakterisieren. Zudem kann die Plattform als Modell für bundesweite Forschung auch in den Natur- und Sozialwissenschaften dienen.

KEYWORDS

Research platform, physician assistants, academic nursing, Research Electronic Data Capture, national registry study

Forschungsplattform, Physician Assistants, akademisierte Pflege, Research Electronic Data Capture, nationale Registerstudie

Introduction

The German healthcare system is characterized by a rapidly increasing shortage of both nursing and medical staff in inpatient as well as outpatient care. In analogy to the development in other countries, the academization of healthcare professions such as academically qualified nurse practitioners (NPs) and physician assistants (PAs) is an interesting option to resolve this staff shortage and stabilize patient care in Germany.

Specifically, there are already more than 2,400 individuals who hold a bachelor's degree in physician assistance in Germany¹. However, to fully integrate these health professionals in the German healthcare system and to fully utilize their potential for patient care, more data about the role of PAs in the German healthcare system is urgently needed. In addition, the concept of academically qualified NPs is currently among the most promising strategies to address structural deficits and the ongoing nursing shortage. In countries such as the United States and across parts of Europe, both nursing

and physician assistance are well established within universities, scientific research, and higher education. In Germany, however, there is a scarcity of national data on these novel healthcare professionals.

Taken together, for the full implementation of novel healthcare professionals such as PAs and academically trained NPs in the German healthcare system, it is necessary to generate further data assessing and validating these promising healthcare professions. Although the efficiency, cost-effectiveness and quality of patient care could be demonstrated for healthcare professionals such as NPs and PAs in other countries including the United States, the Netherlands and United Kingdom²⁻⁹, it still requires more evidence to show if these data can also be transferred one-to-one to the German healthcare system.

Thus, a research platform is necessary to research and elucidate the role of new academic healthcare professions such as NPs and PAs within the German healthcare system. Here, we describe the development of this research platform at the Deggendorf Institute of Technology (DIT), the selection process of the data management tool Research Electronic Data

Capture (REDCap) and its applicability in the context of two national healthcare profession registries.

Methods

In order to establish a research platform which allows the standardized longitudinal nationwide capture of pseudonymized data on new health professions such as PAs and NPs including their contribution to patient care in Germany, several modules, researching tools and software options were evaluated. As data safety, feasibility, versatility and power are essential, the REDCap system was chosen and implemented at the DIT as part of this novel research platform. In former years and for anonymous purposes, the DIT used LimeSurvey. However, longitudinal pseudonymized data capture, meaning multiple survey answers over consecutive years attributable to one participant ID as well as attributable proxy assessments are essential for this research platform and thus guided the selection process. As REDCap is capable of meeting these characteristics and is freely available, it was chosen over LimeSurvey. However, REDCap has its limitations as e.g. integrated statistical analyses are not included in REDCap itself. Also, identifying a participant's

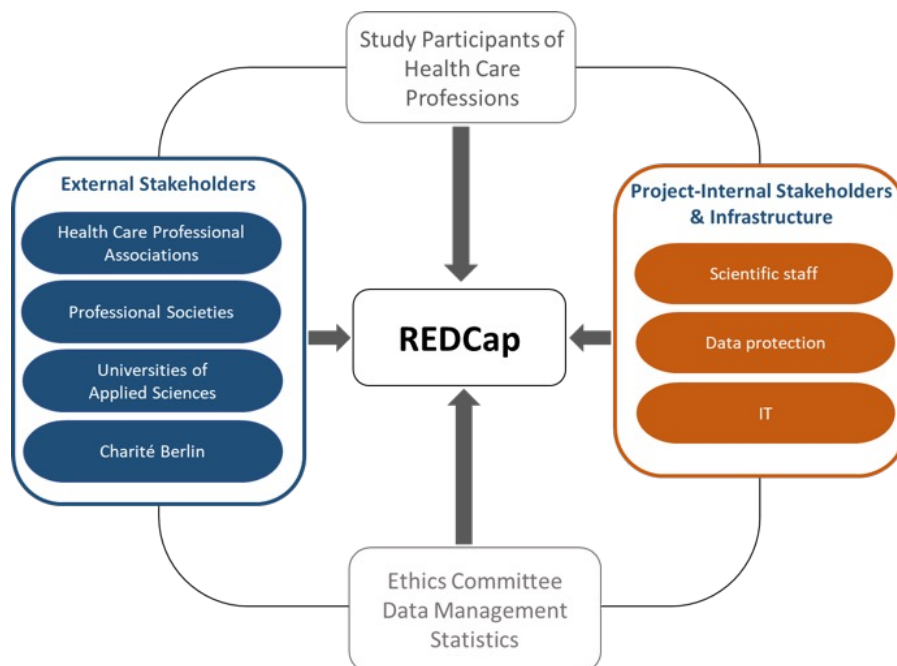


Figure 1: Novel research platform at the Deggendorf Institute of Technology using REDCap to research new academic health care professions. Relevant modules encompass project-internal and external stakeholders, data management including ethical approval and statistics as well as enrollment of study participants.

data (such as an email address) may not be stored in the same data set as personal study data according to data protection laws. Thus, these and other tasks were included in separate modules of the researching platform (Figure 1) and the research platform is described in detail below.

Results

New research platform to investigate novel healthcare professions

In order to generate data for the implementation of new healthcare professions such as PAs and NPs within the German healthcare system, a research platform is necessary. For this purpose, REDCap has been implemented at the DIT as part of this research platform (Figure 1). Further modules include the de-identifying of email addresses, ethical approval, data safety, statistics, data collection, data management/processing and data interpretation (for details see Figure 1).

REDCap

REDCap is a web-based data management system, which is increasingly established in biomedical and health science research. It was

created at the Vanderbilt University, USA, in 2004, but it is used worldwide. The system supports electronic data collection, storage and management, focused on security, traceability and flexibility. As of May 2025, there are already over 2.4 million projects worldwide involving more than 3.7 million users. The “REDCap consortium” includes more than 7,800 active partners across 160 countries (according to <https://projectredcap.org/about/>).

In Germany, REDCap is increasingly being adopted at medical universities and university hospitals. The platform is an efficient tool for conducting clinical and psychological studies due to its versatile functionalities, such as the ability to collect longitudinal data, individually timestamped documentation, and email-based participant invitations. The “Charité Berlin”, a university hospital, has been a member of the REDCap consortium since 2014 and has since then conducted over 300 studies using REDCap. In 2020, Charité, together with the “Technologie- und Methodenplattform für die vernetzte medizinische Forschung e. V.” (TMF), the Technology and Methods Platform for Networked Medical Research, founded the “REDCap German User Group” (GUG), which holds annual meetings. In addition, regular REDCap user meetings are held at Charité.

Data security and privacy	User- and role-based access control Audit trails for tracking changes
Data collection instruments	Online forms and surveys without programming knowledge Branching logics for dynamic question paths Randomization tools for clinical trials
Longitudinal data and events	Longitudinal studies with repeated time points Organization of data and events by time points Alerts
Data export and interoperability	Export to formats such as CSV, SPSS, SAS, R, Stata Data dictionaries and metadata standards
Web-based and mobile-friendly	Access via browser REDCap mobile app Email notifications for automated workflows
Costs	Freely available, no-cost resource
Access options	Public survey link QR code Custom survey link Survey access code Embedded codes
Language	Multi-language management

Table 1: Features of REDCap

An essential benefit of REDCap is the standardized and structured data collection, assisted by individual configurable forms, validation rules and branching logics.

Additionally, REDCap allows time-staggered data collection (longitudinal design) and the assignment of individual user-level permissions, enabling a differentiated distribution of roles within project teams. The traceability of data processing is ensured through audit trails, automatic logs of all changes, which is particularly crucial for studies with high demands on data protection and ethical standards in science. REDCap also provides comprehensive data export features, simplifying the processing of collected data (Table 1).

However, several challenges must be considered. REDCap necessitates a certain level of technical competence and organizational effort. The user interface is functional but not always intuitive, which can result in a longer onboarding period, especially for new users. Moreover, project configuration can be complex, particularly in longitudinal designs with multiple data collection time points. Therefore, a solid knowledge of study design and data management is required.

De-identification of email addresses

In accordance with data protection regulations, identifying information such as email addresses must not be stored alongside study data. To ensure compliance, a minimalistic pseudonymization server with its own database was implemented to which the staff has no access. When a participant enters their email address in REDCap, it is automatically replaced with a pseudonym in the dataset. Emails sent via REDCap are re-identified at the time of dispatch, ensuring researchers only see pseudonyms and communications must occur only within REDCap. This solution was developed in collaboration with the Clinical Trial Office of Charité – Universitätsmedizin Berlin and the IT Center of the DIT.

Study design

The aim is to systematically capture the areas of application and responsibilities, work areas, and working conditions of healthcare professionals longitudinally, e.g. on an annual basis. The studies are aimed at students in healthcare profession programs such as nursing and PA programs, as well as at employed academically

trained healthcare professionals. Data collection takes place across various German locations in cooperation with universities, hospitals, and health profession organizations. The data protection officers of the DIT and the ethical review board of the Bavarian Universities of Applied Sciences (Gemeinsame Ethikkommission der Hochschulen Bayerns, GEHBa) were involved and already approved the first initiatives of this novel research platform.

Data collection

Data entry can be structured into basic general data (e.g. data on education and degrees) and longitudinal follow-up data (e.g. details on professional activities). The data collection is standardized at longitudinal collection points. Participants are guided through a series of structured questionnaires. The online survey is conducted via servers at the DIT, with access available nationwide and without VPN restrictions. At every follow-up, a participant can decide whether a proxy (e.g. a colleague in the interprofessional team) should be able to answer questions regarding the impact of the profession on patient care and interprofessional collaboration (“proxy questionnaires”) via a personal link to a specific questionnaire.

Data management

The collection and management of study data is carried out electronically through the REDCap system. REDCap uses validation rules, filter logic, and timestamps to ensure traceability and data quality. Access rights are regulated through role-based user accounts, enabling targeted and data protection-compliant control of data entries. Data export and storage are performed in anonymized or pseudonymized form.

Statistical analysis

REDCap itself does not provide a function for statistical analysis. However, the collected data can be exported in various formats including widely used applications (such as csv/Microsoft Excel, SPSS Statistical Software, SAS Statistical Software, R Statistical Software, Stata Statistical Software or CDISC ODM). A separate module of the research platform consisting of a statistician and experts with experience in multinational registry studies performs the statistical analyses using the above-mentioned software.

Expanding fields of application at the DIT

Overall, REDCap offers a powerful and versatile system for conducting longitudinal structured data collection in scientific research. Although historically REDCap has primarily been established in biomedical and health science research, it is increasingly being used for studies from various applied sciences due to its broad functionalities, such as collection of longitudinal data, individual documentation, proxy assessments and email-based participant invitations. It therefore also qualifies for a broader spectrum in applied sciences, such as other natural sciences and social sciences. Its benefits are particularly evident when the necessary technical infrastructure and methodological expertise are in place, like at the DIT, to make optimal use of the platform.

Discussion

Given the rapidly increasing shortage of both nursing and medical staff within the German healthcare system, the academization of healthcare professions such as academically qualified NPs and PAs is an interesting option to resolve this staff shortage and to stabilize patient care in Germany. Although this approach was already successful in other countries such as the United States of America, it still needs to be demonstrated if this can be transferred one-to-one to the German healthcare system. Still, academic programs for healthcare professions are rapidly evolving. In the Faculty of Applied Healthcare Sciences at the DIT, there are academic programs for various healthcare professions including nursing, paramedics, physiotherapists, social workers and PAs. German-wide, there are more than 2,400 individuals who hold a bachelor's degree in physician assistance¹ and about 1.67 million nurses, of whom between 1 and 2 % have a university degree, which corresponds to between 16,700 and 33,400 nurses with an academic background¹⁰. We urgently await further data to explore whether the academization of health professions can, in analogy to other countries, serve as an opportunity to stabilize patient care and resolve staff shortage in Germany. In addition, the scientific basis for the full integration of these already graduated health professionals into the German healthcare system and the full utilization of their potential for patient care is urgently needed.

Thus, a research platform to generate these data was implemented at the DIT and is depicted in this manuscript. Core of this research platform is the implementation of a software, which allows the standardized longitudinal nationwide capture of pseudonymized data on new health professions such as PAs and NPs including their contribution to patient care in Germany. Several criteria were used to evaluate various software such as data safety, feasibility, versatility and power, which are essential. Therefore and following thorough consideration, the REDCap system was chosen and implemented at the DIT as part of this research platform. REDCap was created in 2004 and since then has been increasingly employed in research. For example, Cressati et al. have recently published the use of REDCap within The Canadian Open Parkinson Network (C-OPN), a national research platform generated to advance Parkinson's disease research, comprising de-identification of data concerning demographics, symptoms and signs, treatment approaches and standardized assessments¹¹. Moreover, Pivetta et al. used a REDCap-based research platform for a trauma registry and to validate local quality indicators as improvement opportunities in trauma management¹². With regard to research concerning PAs and NPs, REDCap-based research platforms have previously been used to assess these professions in varying contexts^{13–19}.

However, REDCap has several limitations. Specifically, integrated statistical analyses are not possible in REDCap itself. Therefore, it was essential to establish another module within this research platform to enable statistical analysis. Part of this statistics module are expert researchers with a long-standing experience who were previously in charge of the statistical analysis of large multinational registries and their statistical analyses^{20–22}.

In summary, this research platform is able to lay the foundation for research on the role of new academic healthcare professions such as NPs and PAs within the German healthcare system. Moreover, from a local 'DIT' point of view, the research platform about academically qualified healthcare professions can function as a role model for integrating REDCap in other applied sciences as REDCap has successfully been implemented in organizational and personal infrastructure at the DIT.

References

1. Heistermann P, Deutscher Hochschulverband Physician Assistant e.V. Grenzen des Wachstums der Studiengänge zum Physician Assistant? Accessed December 7, 2025. <https://www.hochschulverband-pa.de/wp-content/uploads/2025/02/Datenerhebung-DHPA-2024-07.02.2025.pdf>.
2. Drennan VM, Halter M, Joly L, et al. Physician associates and GPs in primary care: a comparison. *Br J Gen Pract J R Coll Gen Pract*. 2015;65(634):e344–350. <https://doi.org/10.3399/bjgp15X684877>.
3. van den Brink GT, Kouwen AJ, Hooker RS, Vermeulen H, Laurant MG. PA and NP general practice employment in the Netherlands. *JAAPA Off J Am Acad Physician Assist*. 2023;36(12):30–36. <https://doi.org/10.1097/01.JAA.0000991348.71693.1c>.
4. Halter M, Drennan V, Wang C, et al. Comparing physician associates and foundation year two doctors-in-training undertaking emergency medicine consultations in England: a mixed-methods study of processes and outcomes. *BMJ Open*. 2020;10(9):e037557. <https://doi.org/10.1136/bmjopen-2020-037557>.
4. Timmermans MJC, van den Brink GT, van Vught AJAH, et al. The involvement of physician assistants in inpatient care in hospitals in the Netherlands: a cost-effectiveness analysis. *BMJ Open*. 2017;7(7):e016405. <https://doi.org/10.1136/bmjopen-2017-016405>.
5. van den Brink GTWJ, Hooker RS, Van Vught AJ, Vermeulen H, Laurant MGH. The cost-effectiveness of physician assistants/associates: A systematic review of international evidence. *PloS One*. 2021;16(11):e0259183. <https://doi.org/10.1371/journal.pone.0259183>.
6. Martin-Misener R, Harbman P, Donald F, et al. Cost-effectiveness of nurse practitioners in primary and specialised ambulatory care: systematic review. *BMJ Open*. 2015;5(6):e007167. <https://doi.org/10.1136/bmjopen-2014-007167>.
7. Donald F, Kilpatrick K, Reid K, et al. A systematic review of the cost-effectiveness of nurse practitioners and clinical nurse specialists: what is the quality of the evidence? *Nurs Res Pract*. 2014;2014:896587. <https://doi.org/10.1155/2014/896587>.
9. Li Y, Aiken LH, Becker ER, et al. The effect of registered nurse staffing and skill mix on length of stay and hospital costs. *Nurs Outlook*. 2025;73(2):102356. <https://doi.org/10.1016/j.outlook.2025.102356>.
10. Carstensen J, Seiber H, Wiethölter D. Internationalisierung der Pflege – Pflegekräfte mit ausländischer Staatsangehörigkeit und ihr Beitrag zur Fachkräftesicherung.
11. Cressatti M, Pinilla-Monsalve GD, Blais M, et al. Advancing Parkinson’s Disease Research in Canada: The Canadian Open Parkinson Network (C-OPN) Cohort. *J Park Dis*. 2024;14(7):1481–1494. <https://doi.org/10.3233/JPD-240213>.
12. Pivetta LGA, Antunes PDSL, Shimoda GM, Parreira JG, Perlingeiro JAG, Assef JC. Trauma Registry: Trauma Quality indicators analysis in hospitalized patients. *Rev Col Bras Cir*. 2024;51:e20243604. <https://doi.org/10.1590/0100-6991e-20243604-en>.
13. Otto M, Sterling M, Siegler E, Eiss B. Assessing Origins of Quality Gaps in Discharge Summaries: A Survey of Resident Physician Attitudes. *J Biomed Educ*. 2015;2015:341759. <https://doi.org/10.1155/2015/341759>.
14. Muniz NA. How Do Physicians and Nurse Practitioners Perceive the Title Change from Physician Assistant to Physician Associate? *J Allied Health*. 2024;53(1):e49–e53.
15. Shimpi N, Bharatkumar A, Jethwani M, et al. Knowledgeability, Attitude and Behavior of Primary Care Providers Towards Oral Cancer: a Pilot Study. *J Cancer Educ Off J Am Assoc Cancer Educ*. 2018;33(2):359–364. <https://doi.org/10.1007/s13187-016-1084-4>.
16. Johnson BL, Rosenfeld EH, Carter BD, et al. An assessment of provider satisfaction with the use of a standardized visual aid for informed consent for appendectomy in children. *J Pediatr Surg*. 2020;55(5):913–916. <https://doi.org/10.1016/j.jpedsurg.2020.01.044>.
17. Burrowes SAB, Barlam TF, Skinner A, Berger R, Ni P, Drainoni ML. Provider views on rapid diagnostic tests and antibiotic prescribing for respiratory tract infections: A mixed methods study. *PloS One*. 2021;16(11):e0260598. <https://doi.org/10.1371/journal.pone.0260598>.
18. Boyce DJ, Shiffrin MM, Moses SR, Moss CR. Perceptions of motivating factors and barriers to precepting. *J Am Assoc Nurse Pract*. 2022;34(11):1225–1234. <https://doi.org/10.1097/JXX.0000000000000788>.

**Implementation of a Novel Research Platform to Research New Academic Healthcare Professions
at the Deggendorf Institute of Technology**

19. Na HK, Cacchione PZ, Cannon J, Schwab CW, Yelon JA. Military-Civilian Partnership to Improve Combat Casualty Care Readiness Among Non-physician Providers. *Mil Med.* 2025;190(3-4):817–822. <https://doi.org/10.1093/milmed/usae425>.
20. Ebner K, Schaefer F, Liebau MC, ARegPKD Consortium. Recent Progress of the ARegPKD Registry Study on Autosomal Recessive Polycystic Kidney Disease. *Front Pediatr.* 2017;5:18. <https://doi.org/10.3389/fped.2017.00018>.
21. Burgmaier K, Ariceta G, Bald M, et al. Severe neurological outcomes after very early bilateral nephrectomies in patients with autosomal recessive polycystic kidney disease (ARPKD). *Sci Rep.* 2020;10(1). <https://doi.org/10.1038/s41598-020-71956-1>.
22. Burgmaier K, Brinker L, Erger F, et al. Refining genotype-phenotype correlations in 304 patients with autosomal recessive polycystic kidney disease and PKHD1 gene variants. *Kidney Int.* 2021;100(3):650–659. <https://doi.org/10.1016/j.kint.2021.04.019>.