

Motivation Letter - Medimile Project

Dr. Sonja Häckel
Inselspital, Department for Orthopaedic Surgery
Freiburgstrasse 18
3012 Bern, Switzerland

Email: sonja.haeckel@insel.ch

Date: 21.04.2024

Dear VSAO Grant Selection Committee,

As an Orthopaedic Surgery and Traumatology Junior Consultant at Inselspital Bern, and having recently been approved for the habilitation procedure at the University of Bern, I am deeply passionate about advancing medical education and mentorship. My extensive experience, ranging from clinical practice to significant research contributions, positions me uniquely to contribute effectively to the Medimile project. This initiative not only aligns with my professional aspirations but also harmonizes with the core themes emphasized by VSAO, particularly in fostering gender equality and diversity within medical disciplines.

Contribution to Medimile: In the Medimile project, I will leverage my expertise in orthopedics and spine surgery and my experience as chair of the mentorship programme at [Swiss Female Orthopaedics](#). In the Medimile project, my role will be pivotal in shaping the platform's development from conception through to implementation. I will be responsible for crafting the basic structural design of the app, ensuring that it meets the specific needs of our target users, particularly focusing on fostering gender equality and supporting diverse medical practitioners. My responsibilities will extend to overseeing and guiding both the developers and designers of the app. I plan to conduct regular meetings to ensure the development process aligns with our strategic goals, making sure that the app is not only functional but also user-friendly and tailored to the needs of medical professionals. Additionally, I will take an active role in the testing phase of the app. This will involve organizing pilot testing rounds with real users from our community, collecting and analyzing feedback, and making informed decisions on necessary adjustments. The iterative process of testing and refining the app will be crucial to ensure its effectiveness and usability.

Survey Execution: A key component of this project involves conducting an in-depth survey to identify the mentorship needs and expectations of Swiss medical residents and students. In collaboration with the Vizerektorat Lehre at the University of Bern, I plan to spearhead this initiative. With 50% of my time dedicated to research, I will have sufficient capacity to manage this aspect alongside supervising a master's student assigned to this project. This survey will provide critical data to tailor Medimile effectively to user needs.

Motivation Letter - Medimile Project

Beyond the initial launch, I am committed to the continuous improvement of Medimile. I will monitor the app's performance and user engagement, identifying opportunities for further development. This ongoing development will aim to incorporate the latest medical educational methodologies and technology advancements, ensuring the platform remains at the cutting edge and continues to effectively serve its purpose.

Career Goals: My career goal is to establish myself as a leader in orthopedic spine surgery and to be a driving force for transformative changes in medical education and mentorship. I am committed to enhancing the training and professional development of medical personnel, ensuring they are well-equipped to face the diverse challenges of the healthcare sector. The Medimile project is a pivotal step towards achieving these objectives, providing a platform to mentor the next generation of medical professionals effectively.

Relevance to VSAO Themes: Medimile's mission to improve mentorship in medicine directly addresses several VSAO themes such as gender equality, diversity in medicine, and the balance between professional and personal life. The platform's innovative approach in providing free, accessible mentorship opportunities is particularly critical for supporting female medical professionals, who often face unique challenges in balancing these aspects. Through Medimile, I aim to foster an inclusive medical community that values and promotes diversity and equality.

Thank you for considering my application. I am eager to bring my vision and passion to the Medimile project, contributing to its success and the advancement of medical education and mentorship.

Yours sincerely,



Dr. Sonja Häckel

MD, Junior Consultant (*Oberärztin iV*)

Department of Orthopaedics and Traumatology, Inselspital Bern

Medimile: Bridging the Gap from Medical Education to Advanced Training - Revolutionizing Mentorship in Medicine with an Innovative Platform for Networking and Continuing Education

Our project seeks to develop "Medimile," a pioneering web-based app designed to enhance mentorship within the Swiss medical community. Targeting both medical students and residents, this initiative aims to address the acute need for effective, accessible mentorship which has become increasingly crucial due to the high attrition rates among medical professionals primarily driven by burnout and dissatisfaction related to poor work-life balance.

In collaboration with the *Vizerektorat Lehre* at the University of Bern, we will first conduct a detailed survey to determine the specific mentorship needs, preferences, and expectations of approximately 24,000 potential mentees, comprising both students and residents. We anticipate a 20% response rate, which should yield a substantial dataset to inform the subsequent customization of the mentorship program. The survey will be distributed in German, French, and Italian across multiple channels including emails, social media, and professional networks to ensure broad participation.

Following the survey phase, we will develop Medimile. This application will use an advanced algorithm-based system for matching mentors and mentees, considering the individual needs and contributions of each user. The user interface of Medimile will be designed for ease of use, facilitating smooth communication and effective interaction between users, essential for a successful mentorship experience.

Medimile is poised to revolutionize traditional mentoring approaches by leveraging modern technology to establish a supportive network that promotes professional growth, gender equality, and diversity within the medical field. By making mentorship easily accessible to all healthcare professionals in Switzerland, regardless of their financial status, Medimile aims to not only enhance the professional journey of individual mentees but also to foster a more resilient and satisfied medical workforce. This project is expected to set a precedent for mentorship practices globally, showcasing the potential of technology in transforming professional development in medicine.

Medimile: Bridging the Gap from Medical Education to Advanced Training - Revolutionizing Mentorship in Medicine with an Innovative Platform for Networking and Continuing Education

Background

Mentoring programs have consistently demonstrated their effectiveness in improving job satisfaction, increasing engagement, and boosting productivity in various professional settings. Moreover, they play a crucial role in mitigating personal isolation, stress, burnout, and team turnover as it has been shown in several studies[1–3].

Currently, there are approximately 1000 medical graduates in Switzerland each year. However, a significant portion is uncertain about pursuing a career in medicine. One third of these students have considered opting out of the medical profession. This sentiment is echoed by 43% of sixth-year students who have frequently or occasionally contemplated abandoning their medical studies [4, 5]. The primary reason, even more than the academic pressure, is the anticipation of a career known for its challenging work-life balance. This disillusionment is particularly profound among women, who constitute two-thirds of the medical student population[6].

While modern mentorship programs are available as software solutions, they are primarily targeted towards large companies. Examples include platforms like "The Growth Hub" and "Together" [7, 8]. A local existing coaching program initiated by *Verein der leitenden Spitalärztinnen und -ärzte Schweiz* (VLSS), *Verband Schweizerischer Assistenz- und Oberärztinnen und -ärzte* (VSAO), *Haus- und Kinderärzte Schweiz* (mfe), and Swiss Medical Students Association (swimsa), with the support of Schweizerisches Institut für ärztliche Weiter- und Fortbildung (SIWF), named the "Coach my Career" intergenerational mentoring program[9]. However, this program only offers a single session lasting two hours, facilitated by two mentors: one from a non-medical background and the other a seasoned professional, often a retired senior doctor or a well-established general practitioner. Moreover, the program charges a fee for students, assistant, and senior doctors.

The upcoming Generation Z, having been raised in the digital age, finds smartphones and swift modes of communication indispensable. To address the need for accessible and efficient mentorship, we propose the development of an innovative app that streamlines the process of mentorship matching. With a modern approach, our goal is to democratize mentorship, making it accessible to individuals regardless of their financial status. Mentors and mentees can register for free on our platform. Utilizing a sophisticated algorithm, our app will facilitate optimal mentorship matches based on the specific needs and offerings of both parties.

Our app represents a significant advancement from the existing mentorship program established by the Swiss Female Orthopaedics association[10]. This project represents a collaborative effort to harness the power of technology for the betterment of mentorship practices in medicine, with the ultimate goal of fostering professional growth, gender equality, and innovation in the field of orthopedics and beyond.

Aim

1) Assess Mentorship Demand and Preferences

To conduct a comprehensive survey to identify the specific mentorship needs, preferences, and expectations of Swiss medical residents and students. This will help tailor the mentorship program to align with the actual requirements and aspirations of mentees.

- 2) **Development of the Web-Based App "Medimile":** Develop a user-friendly and visually appealing web-based app that facilitates connections between mentors and mentees in the field of medicine

Technical Goals (App Development):

- 1) Enhanced Searchability: Ensure that individuals seeking mentorship and those offering mentorship are easily discoverable within the specific thematic area of orthopedics.
- 2) Advanced Filtering Capabilities: Implement predefined filter criteria to refine search results and match mentees with mentors based on their specific needs and preferences.
- 3) Initiation of Contact: Facilitate the initiation of contact between mentorship candidates through the Medimile platform, enabling seamless communication and interaction between mentors and mentees.

Future Milestones: Evaluate the Impact of Mentorship on Professional Development

Following the successful development of our application, we intend to conduct a prospective cohort study to assess how mentorship influences the attainment of professional objectives, such as career advancement and skill enhancement among medical residents. This study will involve a comparative analysis of outcomes between groups receiving mentorship and those without, to determine the effectiveness of our mentorship initiatives.

Methods

Assess Mentorship Demand and Preferences

To understand and measure the impact of mentorship among Swiss medical residents and students, we will collaborate with the *Vizerektorat Lehre* (Learning and Development) at the University of Bern to conduct an in-depth survey. This cross-sectional survey aims to identify the specific mentorship needs and expectations of these groups.

- Target Population: Our survey will reach approximately 10,000 medical students and 13,727 residents across Switzerland, with an anticipated response rate of 20% (expected N: 4.745)
- Survey Design: The survey will collect anonymous data on educational level, year of residency, specialty interests, and prior mentorship experiences. It will include customized questions to ascertain specific mentorship needs, preferences for mentor characteristics (such as level of experience and specialty), and the desired outcomes from the mentorship (like career guidance and research support). Input will be solicited from key stakeholders, including the Swiss Medical Students Association (swimsa), the Association of Swiss Assistant and Senior Physicians (vsao/asmac), and the Swiss Medical Association (FMH).
- Distribution Method: The survey will be available in German, French, and Italian. Distribution will be conducted via email by local associations and the administration offices of Swiss medical schools. Additionally, the survey will be shared on social media platforms and within individual group chats to maximize reach and engagement.
- Survey Administration: The survey will be administered using the web-based tool, Qualtrics XM. This platform will facilitate the efficient distribution and collection of survey data.

Ethical Considerations: All participants will provide informed consent for the use of their data, ensuring transparent communication regarding the purpose and use of their responses. Our study involves voluntary participants and, according to Article 2, paragraph 1 of the Human Research Act (*Humanforschungsgesetz, HFG*), does not necessitate an ethics committee review. This provision applies as the research does not fall under the stipulations that regulate more invasive human research. Furthermore, under the current Swiss *HFG*, the analysis of anonymously collected data that

is not patient-related does not require approval from local ethics committees. In this study, the data were collected in an anonymous format, capturing only age and gender, which supports our commitment to upholding ethical standards and maintaining participant autonomy and data privacy.

App Development

We will identify and specify the essential requirements for the application to achieve the previously mentioned goals. Within this framework, we will define user personas and develop user flows, which will be analyzed both independently and as part of the application. Using simplified wireframes and screen designs to lay the groundwork for the basic logic, our initial development phase will focus on creating a technical Minimum Viable Product (MVP). This MVP will enable the first real users to engage with and evaluate the platform's functionalities. The MVP, does not represent a fully developed application in terms of the finally specified scope of functions, as well as the design and implementation of the interface design. In the first step, it is primarily intended to evaluate the added value and test the adoption by users as a basis for the subsequent elaboration of the project in further development steps. The app will be developed by RPEL GmbH in Bern.



Figure 1 Surface design of the Progressive Web App Medimile

Development Step 1 | Conceptualization and Development of an MVP

Application surface as a Progressive Web App (PWA), available under the already secured domain medimile.app. This is a browser-based application that can be placed by users on the home screen of their device without installation and appears in the look of a native app when opened. The application can also be used as a web application from desktop devices (Figure 1). Account creation and authentication/login functionality, based on a role system (Mentor, Mentee, Admin)

- Profile settings: Storing basic data of users within a profile. Recording of specified mentoring requests and/or offers within the profile settings
- Platform/Main view: Display of profiles with activated requests and offers in abbreviated form. Option to jump to the detail page of a profile.
- Detail view of a profile with activated request/offer: The detailed presentation of a selected profile with corresponding information on activated requests/offers. Option to send a contact request to the selected profile
- Email automations inform about account steps and events
- Initial main goals achieved: Findability/listing of existing mentoring requests/offers
Initiation of contact between interest groups
- Contact handling takes place outside the application in the MVP concept

Development Step 2 | Links/Matches/Connections

- Implementation of so-called "matches" between two profiles.
- Contact requests can now be rejected or confirmed in the app by the requested profile.
- Upon confirmation of a contact request, a connection is created between the two profiles, a so-called match.
- A connection / match can contain its own specific data/information that goes beyond the master data of the two connected profiles.

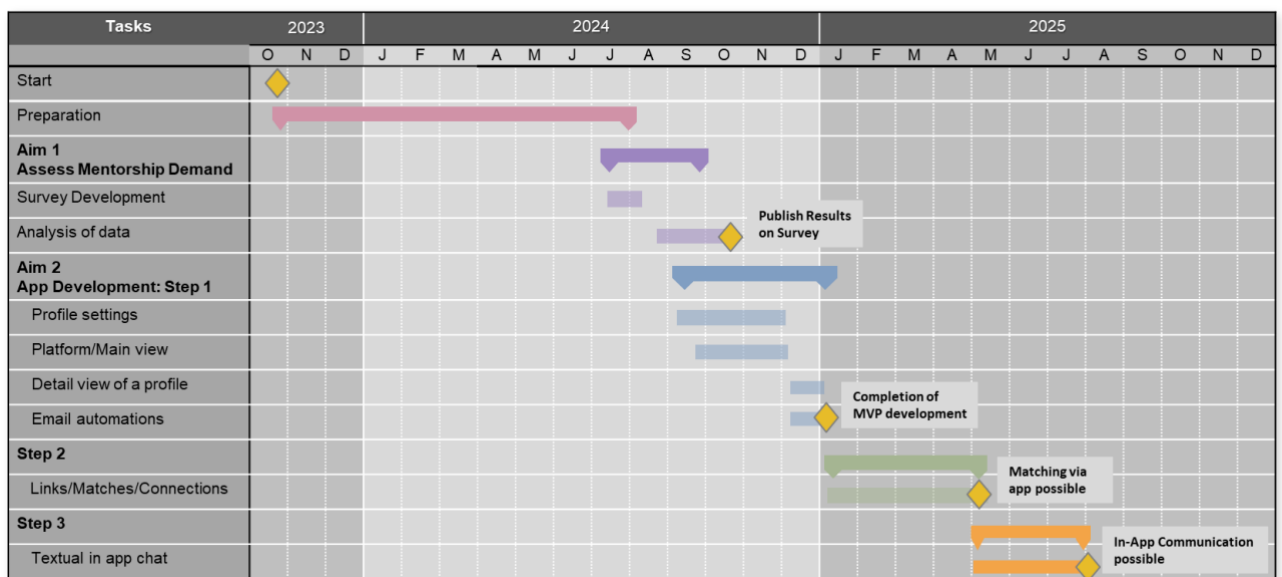
Medimile Projectplan

- The implementation of such a connection primarily serves to enable further functionalities in subsequent development packages (e.g., data storage, goal setting/tracking functions, in-app communication)
- A match has its own interface/screen view and can be opened/called up/displayed by the linked profiles.
- A match includes a status and can be changed or resolved/ended by the provider (or support).

Development Step 3 | In-App Communication

- This step is intended to enable the handling of textual communication within the app.
- The basis here is the connection between two profiles from Development Step 2.
- Within a match, users have the opportunity to communicate with each other textually via a comment feed.
- The scope of functions of a chat-based exchange between profiles remains to be worked out and specified in terms of feasibility/realizability.

Timeline



References

1. Sambunjak D, Straus SE, Marušić, AM. Mentoring in Academic Medicine A Systematic Review.
2. Tripathy S, Satapathy SK. Efficacy of Mentoring in Health Sector: A Literature Review. Train Dev J. 2020;11:17.
3. Walensky RP, Kim Y, Chang Y, Porneala BC, Bristol MN, Armstrong K, et al. The impact of active mentorship: Results from a survey of faculty in the Department of Medicine at Massachusetts General Hospital. BMC Med Educ. 2018;18:1–8.

4. Medizinstudenten: Jeder Dritte zweifelt an einer Zukunft als Arzt.
<https://www.nzz.ch/schweiz/55-stunden-woche-damit-muss-den-kuenftigen-aerztinnen-und-aerzten-niemand-kommen-ld.1768569>. Accessed 15 Mar 2024.
5. Scheiwiler V, Ehrenzeller C, Laager R, Serban L, Reynaud De La Jara M, Lutz L. Survey on Expectations of medical students towards their future profession.
6. Das Medizinstudium in der Schweiz im Profil | Publikation | Bundesamt für Statistik.
<https://www.bfs.admin.ch/bfs/de/home/statistiken/kataloge-datenbanken/publikationen.assetdetail.344434.html>. Accessed 15 Mar 2024.
7. Best Mentorship Software: Together Mentoring Software.
<https://www.togetherplatform.com/>. Accessed 15 Mar 2024.
8. Hub Mentors | The Growth Hub. <https://www.thegrowthhub.biz/hubmentors>. Accessed 15 Mar 2024.
9. Coach my Career | VLSS. <https://www.vlss.ch/karriere/coach-my-career>. Accessed 15 Mar 2024.
10. MENTORSHIP | Swiss Female Orthopaedics.
<https://swissfemaleorthopaedics.ch/mentorship>. Accessed 15 Mar 2024.

Medimile Budget

Development Steps	Estimated Effort (h)	Costs (CHF)
Basis - Development Step 1: Conceptualization and MVP Development (realized RPEL GmbH Bern)	65	9750.00
- Conceptualization	13	1950.00
- UX/UI Design (Wireframing, Screendesigns, Prototypes)	12	1800.00
- Implementation/Development (Programming, Infrastructure)	32	4800.00
- Project Management (Correspondence/Coordination, Planning, Organization)	8	1200.00
Development Step 2: Links/Matches/Connections (realized RPEL GmbH Bern)	28	4200.00
- Conceptualization	5	750.00
- UX/UI Design (Wireframing, Screendesigns, Prototypes)	6	900.00
- Implementation/Development (Programming, Infrastructure)	15	2250.00
- Project Management (Correspondence/Coordination, Planning, Organization)	2	300.00
Development Step 3: In-App Communication (realized RPEL GmbH Bern)	40	6000.00
- Conceptualization	8	1200.00
- UX/UI Design (Wireframing, Screendesigns, Prototypes)	9	1350.00
- Implementation/Development (Programming, Infrastructure)	20	3000.00
- Project Management (Correspondence/Coordination, Planning, Organization)	3	450.00
Total Estimate	133	19950.00

Curriculum vitae – Sonja Häckel

1. Personal information

Name	Sonja Häckel, MD (Dr. med.)
Date of birth	May 3, 1984, Höxter (Germany)
Nationality	German
Address	Seidenweg 12 3012 Bern, Switzerland
Telephone (private)	+41 76 217 25 27
Email	sonja.haekkel@insel.ch
OrcID	https://orcid.org/0000-0002-9415-6633
Languages	German (native), English (fluent), French (intermediate)



Education

12/2023	Approval for the habilitation (<i>Venia docendi</i>) procedure University of Bern, Advisor: Prof. Dr. H. Steinke
09/2023	Postgraduate specialist qualification (<i>FMH Fachärztin</i>): Orthopaedic surgery and traumatology of the locomotor apparatus
Since 06/2023	EUROSPINE Basic Diploma Spine Surgery
Since 12/2022	PhD in Health Sciences (Clinical Sciences), Graduate School for Health Sciences, University of Bern, Switzerland
09/2017 - 06/2020	MD thesis „Fibrin-hyaluronic acid hydrogel and Fibroblast Growth Factor-18 for Intervertebral Disc Regeneration: an in vitro study on bovine and human nucleus pulposus cells" Experimental work, Advisor PD Dr. Sven Hoppe, University of Bern/AO Research Institute Davos, Switzerland
05/2015	State examination and licensure as a doctor (Berlin, Germany)
04/2008 – 05/2015	Medical studies, University Medical School, Charité Berlin (Germany)
09/2001 – 08/2004	Apprenticeship Medical-technical laboratory assistant (MTA) City Clinic Bielefeld Mitte (Germany)

Employment History

Since 10/2022	Orthopaedic Surgery and Traumatology, Junior Consultant <i>Stv. Oberärztin</i> Spine Team (50% clinical, 50% research) Department of Orthopaedics and Traumatology, Inselspital Bern, Prof. Dr Siebenrock
02/2022 – 08/2022	Orthopaedic Spine Fellowship (AOSpine), Neurospine Institute, Perth, WA, Australia
07/2021 – 01/2022	Orthopaedic Trauma Fellowship, Fiona Stanley Hospital, Perth, WA, Australia
11/2018 – 07/2021	Orthopaedic Surgery and Traumatology Senior registrar Department of Orthopaedics and Traumatology, Inselspital Bern, Prof. Dr Siebenrock
09/2017 – 09/2018	Medical Research Fellowship AO Research Institute Davos (Switzerland)
10/2016 – 09/2017	Orthopaedic Surgery and Traumatology Residency Department of Orthopaedics and Traumatology, Spitalzentrum Biel, PD Dr. Büchler (Switzerland)
07/2015 – 07/2016	Orthopaedic Surgery and Traumatology Residency Department of Orthopaedics and Traumatology, Charité Berlin, Prof. Dr. Ertel (Germany)
05/2012 – 06/2015	Student assistant Joint- and Spine Center GWZ Berlin, Dr. Laute (Germany)
11/2009 – 04/2012	Medical-technical laboratory assistant (MTA) DRK Clinic Westend, Berlin (Germany)
09/2004 – 02/2005	Medical-technical laboratory assistant (MTA) Institute of Biochemistry, University of Cologne (Germany)

Approved research projects

12/2023	Promotion of young talent, project pool University of Bern over 1.000 CHF “Medimile - The future of mentoring in medicine: An innovative platform for networking and support”
10/2023	Swiss Orthopaedics Research Fund over 19.296 CHF “Promoting Intervertebral Disc Fusion: Evaluating the Impact of BMP-2, L51P, and KMN-159 in an Ex Vivo Bovine Model (DiscFuse)”
03/2022	Bangerter-Rhyner Foundation ‘Outcome of Surgical versus Primary Non-Surgical Treatment of Burst Fractures of the Thoracolumbar Spine in Patients without Neurological Symptoms: A Randomized Controlled Clinical Trial, 60.000 CHF (Co-Investigator)
03/2022	Swiss Orthopaedics Research Fund over 20.000 CHF “Outcome of Surgical versus Primary Non-Surgical Treatment of Incomplete Burst Fractures of the Thoracolumbar Spine in Patients without Neurological Symptoms: A Randomized Controlled Clinical Trial” (Main applicant)
01/2022	SUVA Grant ‘Outcome of Surgical versus Primary Non-Surgical Treatment of Incomplete

Curriculum vitae

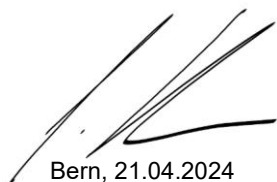
06/2020	Burst Fractures of the Thoracolumbar Spine in Patients without Neurological Symptoms: A Randomized Controlled Clinical Trial, 105.000 CHF (Co-Investigator) European Union's Horizon 2020 research and innovation program over 14.959.781 € (under grant agreement No 825925) "iPSpine - Induced pluripotent stem cell-based therapy for spinal regeneration" (Consortium Member)
01/2020	Swiss Orthopaedics Research Fund over 20.000 CHF "Refinement of current rehabilitation protocols to increase the compliance to weight-bearing restrictions in elderly after fracture fixation" (Main Applicant)
01/2020	ON Foundation Kickstarter Grant over 10.000 CHF "3D Printed Multi-Scale, Cell Instructive Tissue Engineering Scaffolds for Annulus Fibrosus Tissue Regeneration" (Co-Investigator)
01/2019	Swiss Orthopaedics Research Fund over 20.000 CHF "Cox2IVD - Treating Discogenic Pain by Reducing Nerve Sensitization and Ingrowth using the COX-2 Inhibitor Celecoxib – An in vitro Study with Inflamed Dorsal Root Ganglion Cells" (Main Applicant)

Active memberships

Since 2023	Schweizerische Gesellschaft fuer spinale Chirurgie (SGS)
Since 2022	Swiss Female Orthopaedics (chair – mentorship programme)
Since 2021	Eurospine
Since 2020	German Spine Society (DWG) – Spine Science Bone and Cartilage; Junges Forum
Since 2019	Orthopaedic Research Society (ORS) – Spine Section
2019 - 2023	APO – Swiss Association for Prosthesis and Orthosis
Since 2018	AO (<i>Arbeitsgemeinschaft für Osteosynthesefragen</i>) – Spine Section
Since 2018	AO (<i>Arbeitsgemeinschaft für Osteosynthesefragen</i>) – Trauma Section
Since 2017	Swiss Orthopaedics (junior member)
Since 2017	Swiss Association of Residents and Senior Doctors (VSAO)
Since 2017	Swiss Medical Association (FMH)

Prizes, Awards, and Fellowships

05/2023	'Rob Johnston award' at the Spine Society of Australia 34th Annual Scientific Meeting on 'First long-term follow-up results on wear-induced osteolysis following cervical total disc replacement using the M6-C™ Artificial Cervical Disc', 1.000 AUD
05/2023	Early Career Scholarship at the 34th Annual Scientific Meeting of the Spine Society of Australia, 1.600 AUD
03/2023	Junior Researcher Grant for patient-oriented research (with protected research time) Department Forschung und Lehre 'Outcome of Surgical versus Primary Non-Surgical Treatment of Burst Fractures of the Thoracolumbar Spine in Patients without Neurological Symptoms: A Randomized Controlled Clinical Trial'; Insel Gruppe AG, 80.000 CHF
02/2022 – 09/2022	AO-Spine clinical and research Fellowship, Neurospine Institute, Perth, WA, Australia, Dr. Paul Taylor
07/2021 – 01/2022	Orthopaedic clinical and research Fellowship, Fiona Stanley Hospital, Perth, WA, Australia, Prof. GH Prosser
08/2021	Best Special Poster Award at the ISSLS Virtual Annual Meeting 2021 «Can the COX-2 Inhibitor Celecoxib Influence Discogenic Pain Signals? An In Vitro Study with Inflamed Annulus Fibrosus Cells»
05/2021	Young Talents in Clinical Research Award; 75.000 CHF for protected research time, Swiss Academy for Medical Sciences
12/2020	Winner of the AO Spine ESA 2020 Young Researcher Grant, over 7.500 CHF « Treating Discogenic Pain by Reducing Nerve Sensitization and Ingrowth using COX-2 Inhibitor Celecoxib » (Main Applicant)
04/2020 – 04/2021	COMET "Coaching, Mentoring, and Training for Women" Career Programme for female researchers; approx. 3.500 CHF
09/2017 – 09/2018	Marie Skłodowska-Curie Actions Stipend (Early Stage Researcher, Targeting Cartilage and Regeneration in Joint and Intervertebral Disc Diseases - Target CaRe Project); approx. 60.000 CHF



Bern, 21.04.2024

Peer-reviewed Publications (Original articles)

1. Labus J, **Häckel S**, Lucka L, Danker K. Interleukin-1 β induces an inflammatory response and the breakdown of the endothelial cell layer in an improved human THBMEC-based in vitro blood-brain barrier model. *Journal of Neuroscience Methods*.; 228:35-45 2014
2. Pelz C, **Häckel S**, Semini G, Schrötter S, Bintig W, Stricker S, Mrawietz G, Klein A, Lucka L, Shmanai V, Eickholt B, Hildmann A, Danker K. Inositol-C2-PAF acts as a biological response modifier and antagonizes cancer-relevant processes in mammary carcinoma cells. *Cellular Oncology*.;41(5):505-516. 2018
3. Labus J, Wöltje K, Stolte KN, **Häckel S**, Kim KS, Hildmann A, Danker K. IL-1 β promotes transendothelial migration of PBMCs by upregulation of the FN/ α 5 β 1 signalling pathway in immortalised human brain microvascular endothelial cells. *Experimental Cell Research*.;373(1-2):99-111. 2018
4. **Häckel S**, Zolfaghar M, Du J, et al. Fibrin-hyaluronic acid hydrogel (Regenogel) with fibroblast growth factor-18 for in vitro 3D culture of human and bovine nucleus pulposus cells. *International Journal of Molecular Sciences*.;20(20):5036. 2019
5. **Häckel S**, Albers CE, Bastian JD, Hoppe S, Benneker LM, Keel MJB. Direct anterior decompression of L4 and L5 nerve root in sacral fractures using the pararectus approach: a technical note. *Archives of Orthopaedic and Trauma Surgery*.;140(3):343-351. 2020
6. Deml MC, Mazuret Sepulveda CA, Albers CE, Hoppe S, Bigdon SF, **Häckel S**, Milavec H, Benneker LM. Anterior column reconstruction of the thoracolumbar spine with a new modular PEEK vertebral body replacement device: retrospective clinical and radiologic cohort analysis of 48 cases with 1.7-years follow-up. *European Spine Journal*.;29(12):3194-3202. 2020
7. Du J, Pfannkuche JJ, Lang G, **Häckel S**, Creemers LB, Alini M, Grad S, Li Z. Proinflammatory intervertebral disc cell and organ culture models induced by tumor necrosis factor alpha. *Jor Spine*.;3(3):1-12. 2020
8. Zhang X, Guerrero J, Croft AS, Albers CE, **Häckel S**, Gantenbein B. Spheroid-like cultures for expanding angiopoietin receptor-1 (aka. Tie2) positive cells from the human intervertebral disc. *International Journal of Molecular Sciences*.;21(24):1-17. 2020
9. Saravi B, Li Z, Basoli V, Grad S, **Häckel S**, Albers CE, Alini M, Schmal H, Obid P, Lang G. Angiotensin II Type 1 Receptor Antagonist Losartan Inhibits TNF- α -Induced Inflammation and Degeneration Processes in Human Nucleus Pulposus Cells. *Applied Sciences*.;11(1):417. 2021
10. Wangler S, Kamali A, Wapp C, Wuertz-Kozak K, **Häckel S**, Fortes C, Benneker LM, Haglund L, Richards RG, Alini M, Peroglio M, Grad S. Uncovering the secretome of mesenchymal stromal cells exposed to healthy, traumatic, and degenerative intervertebral discs: a proteomic analysis. *Stem Cell Research and Therapy*.;12(1):1-17. 2021
11. **Häckel S**, Hofmann E, Anwander H, et al. Anterior-posterior view by full-body digital X-ray to rule out severe spinal injuries in Polytraumatized patients. *BMC Emergency Medicine*.;21(1):1-10. 2021
12. Hoppe S, Maurer D, Valenzuela W, Benneker LM, Bigdon SF, **Häckel S**, Wangler S, Albers CE. 3D analysis of fatty infiltration of the paravertebral lumbar muscles using T2 images—a new approach. *European Spine Journal*.; 1:1-7. 2021
13. Guerrero J, **Häckel S**, Croft AS, Albers CE, Gantenbein B. The effects of 3D culture on the expansion and maintenance of nucleus pulposus progenitor cell multipotency. *Jor Spine*.;4(1). 2021
14. Croft AS, Guerrero J, Oswald KAC, **Häckel S**, Albers CE, Gantenbein B. Effect of different cryopreservation media on human nucleus pulposus cells' viability and trilineage potential. *Jor Spine*.;4(1). 2021
15. **Häckel S**, Renggli AA, Albers CE, et al. How to measure the outcome in the surgical treatment of vertebral compression fractures? A systematic literature review of highly cited level-I studies. *BMC Musculoskeletal Disorders*.;22(1). 2021
16. Zhang X, Guerrero J, Croft AS, **Häckel S**, et al. Towards Tissue-Specific Stem Cell Therapy for the Intervertebral Disc: PPAR δ Agonist Increases the Yield of Human Nucleus Pulposus Progenitor Cells in Expansion. *Surgeries*;2(1):92-104. 2021
17. Bischof MC, **Häckel S**, Oberli A, et al. Influence of Angiopoietin Treatment with Hypoxia and Normoxia on Human Intervertebral Disc Progenitor Cell's Proliferation, Metabolic Activity, and Phenotype. *Applied Sciences*.;11(15):7144. 2021
18. Sturm L, Schwemberger B, Menzel U, **Häckel S**, Albers CE, Plank C, Rip J, Alini M, Traweger A, Grad S, Basoli V. In vitro evaluation of a nanoparticle-based mRNA delivery system for cells in the joint. *Biomedicines*.;9(7):794. 2021
19. Du J, Guo W, **Häckel S**, et al. The function of CD146 in human annulus fibrosus cells and mechanism of the regulation by TGF- β . *Journal of Orthopaedic Research*, 40(7), pp. 1661–1671. 2022

Research Output List – Sonja Häckel

20. Hofstee MI, Heider A, **Häckel S**, et al. In vitro 3d staphylococcus aureus abscess communities induce bone marrow cells to expand into myeloid-derived suppressor cells. *Pathogens*;10(11) 2021
21. **Häckel S**, Phurtag RD, Benneker LM, et al. Asia Now Surpasses Europe in Spine Research Productivity. *Spine*, 47(11), pp. E477–E484. 2022
22. **Häckel S**, Christen, S., Vögelin, E., & Keel, M. J. (2022). Exposure of the Lumbosacral Plexus by Using the Pararectus Approach: A Technical Note. *Operative neurosurgery*, 10-1227. 2022
23. Phurtag RD, **Häckel S**, Benneker LM, Liu KB, Albers CE, Ahmad SS, Deml MC. Gender authorship trends in spine research publications - Research across different countries from 1976 to 2020. *Brain Spine*. 2:100889. 2022
24. Saravi B, Li Z, Basoli V, Grad S, **Häckel S**, Albers CE, Alini M, Schmal H, Obid P, Lang G. In Vitro Characterization of a Tissue Renin-Angiotensin System in Human Nucleus Pulposus Cells. *Cells*, 2022, 11(21), 3418.
25. Zuncheddu D, Della Bella E, Petta D, Bärtschi C, **Häckel S**, Deml MC, Stoddart MJ, Grad S, Basoli V. Effect of glucose depletion and fructose administration during chondrogenic commitment in human bone marrow-derived stem cells. *Stem Cell Res Ther*. 2022;13(1):533.
26. **Häckel S**, Oswald KAC, Koller L, Benneker LM, Benneker LA, Sadiqi S, Oner FC, Deml MC. Reliability and Validity of the German Version of the AO Spine Patient Reported Outcome Spine Trauma Questionnaire. *Global Spine J*. 2023
27. Ma J, Häne S, Eglauf J, Pfannkuche J, Soubrier A, Li Z, Peroglio M, Hoppe S, Benneker L, Lang G, Wangler S, Alini M, Creemers LB, Grad S, **Häckel S**. Celecoxib alleviates nociceptor sensitization mediated by interleukin-1beta-primed annulus fibrosus cells. *Eur Spine J*. 32(6):2048-2058. 2023
28. Sobhi S, Finsterwald MA, **Häckel S**, Holzer LA, Yates PJ. Medialized Dome and Anatomic Onlay Patella Designs in the Modern Posterior Stabilized Rotating Platform Total Knee Arthroplasty Demonstrate No Clinical or Radiological Differences at One Year. *J Arthroplasty*. 2024 Jan;39(1):87-95. doi: 10.1016/j.arth.2023.06.005. Epub 2023 Jun 13. PMID: 37321517.
29. **Häckel S**, Kämpf, T., Baur, H. et al. Assessing lower extremity loading during activities of daily living using continuous-scale physical functional performance 10 and wireless sensor insoles: a comparative study between younger and older adults. *Eur J Trauma Emerg Surg* 49, 2521–2529 (2023). <https://doi.org/10.1007/s00068-023-02331-8>
30. **Häckel S**, Haldemann L, Finsterwald M, Yates P. Improved postoperative kneeling ability in posterior stabilized total knee arthroplasty with medialized dome-patella resurfacing: A retrospective comparative outcome analysis. *J ISAKOS*. 2023 Dec 28:S2059-7754(23)00620-X. doi: 10.1016/j.jisako.2023.12.008. Epub ahead of print. PMID: 38159866.
31. Aregger FC, Kreuzer S, **Häckel S**, Bigdon SF, Tinner C, Erbach G, Deml MC, Albers CE. Return to sports/activity level after 360° thoracolumbar fusion after burst fractures in young patients. *Brain Spine*. 2024 Jan 23;4:102762. doi: 10.1016/j.bas.2024.102762. PMID: 38510642; PMCID: PMC10951747.
32. **Häckel S**, Gaff J, Pabbruwe M, Celenza A, Kern M, Taylor P, Miles A, Cunningham G. Heterotopic ossification, osteolysis and implant failure following cervical total disc replacement with the M6-C™ artificial disc. *Eur Spine J*. 2024 Mar;33(3):1292-1299. doi: 10.1007/s00586-024-08129-5. Epub 2024 Feb 16. PMID: 38363365.
33. Sadiqi S, de Gendt EEA, Muijs SPJ, Post MWM, Benneker LM, Holas M, Tee JW, Albers CE, **Häckel S**, Svac J, Bransford RJ, El-Sharkawi MM, Kandziora F, Rajasekaran S, Schnake KJ, Vaccaro AR, Oner FC. Validation of the AO Spine CROST (Clinician Reported Outcome Spine Trauma) in the clinical setting. *Eur Spine J*. 2024 Apr;33(4):1607-1616. doi: 10.1007/s00586-024-08145-5. Epub 2024 Feb 17. PMID: 38367026.

Peer-reviewed Publications (review articles)

1. Colella F, Garcia JP, Sorbona M, Lolli A, Antunes B, D'Atri D, Barré FPY, Oieni J, Vainieri ML, Zerrillo L, Capar S, **Häckel S**, Cai Y, Creemers LB. Drug delivery in intervertebral disc degeneration and osteoarthritis: Selecting the optimal platform for the delivery of disease-modifying agents. *Journal of Controlled Release*. 2020; 328:985-999.
2. Guerrero J, **Häckel S**, Croft AS, Hoppe S, Albers CE, Gantenbein B. The nucleus pulposus microenvironment in the intervertebral disc: the fountain of youth? *European cells & materials*. 2021; 41:707-738.

Infrastructure Description

The Medimile project will benefit from robust support provided by the established infrastructures at Inselspital Bern, the University of Bern, and RPEL GmbH Bern, a multi-professional tech and design team based in Bern. These entities collectively foster a strong technological and academic backdrop that is ideal for the development and evaluation of an advanced web-based application like Medimile.

Technological Infrastructure:

RPEL GmbH, renowned for its cutting-edge concept design and software solutions, is instrumental in our app's development. They provide state-of-the-art tools necessary for creating, implementing, and maintaining sophisticated software applications like Medimile.

Academic and Research Resources:

The Orthopaedic Department at Inselspital Bern, led by Prof. Dr. Christoph E. Albers, fully supports this initiative. This backing extends to the contribution of a medical master student and research assistants who are integral to our project. Additionally, we aim to collaborate with the *Vizerektorat Lehre* (Learning and Development department) at the University of Bern to conduct our foundational survey.

Collaborative Facilities:

Our facilities at Inselspital Bern include collaborative spaces designed for team meetings and workshops, essential for the iterative design and testing of the Medimile app. These spaces are equipped with advanced video conferencing technology, enabling seamless collaboration with remote team members and stakeholders.

References:

Prof. Dr. Christoph E. Albers

Position: Chair a.i. of the Department of Orthopaedic Surgery, Inselspital Bern

Email: christoph.albers@insel.ch

Relation: He has been my supervisor for several years and is a strong supporter of my endeavors to enhance mentorship.

Daniel Schwinn (IT Consulting & Full Stack Development) and Micha Köly (Design, Photography & Front-End) at RPEL GmbH

Emails: micha.koely@rpel.ch, daniel.schwinn@rpel.ch

Infrastructure Description

Relation: Daniel Schwinn and Micha Köly will be critical in developing the technical and design aspects of the Medimile project. Their expertise in IT and creative design will shape the functionality and aesthetic of the app, making it both effective and engaging.

Swiss Female Orthopaedics

Position: Current President, Swiss Female Orthopaedics

Email: mail@swissfemaleorthopaedics.ch

Relation: They are familiar with my role as the current chair of the mentorship committee and can provide insights into my contributions and leadership in promoting gender equality in medicine.

These references and facilities collectively underscore the project's well-supported environment, positioning it for success.

Bern, 19.04.2024

Grant Application: Medimile by Dr. Sonja Häckel

To Whom It May Concern,

This document certifies that Dr. Sonja Häckel is employed in the Canton of Bern, Switzerland. Dr. Häckel has been an integral part of our team at the Department of Orthopaedic Surgery at Inselspital Bern, under my supervision.

Details of Employment:

Position: Orthopaedic Surgeon (*Stellvertretende Oberärztin*)

Department: Orthopaedic Surgery

Institution: Inselspital Bern

Start Date: 01.11.2018

End Date: Ongoing

Dr. Häckel has consistently demonstrated exceptional skill, dedication, and professionalism in her role. Her contributions to our department are highly valued, and her clinical and research activities are vital to the ongoing success of our programs.

Should you require any further information, please do not hesitate to contact me.

Sincerely,



Prof. Dr. med. Christoph E. Albers

Chair a.i., Department of Orthopaedic Surgery
INSELSPITAL, Bern University Hospital
University Clinic for Orthopaedic Surgery and Traumatology