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In-Hospital "Academic Accelerator": Skill Acquisition in Research Is Strongly Associated with Emotional and Organizational Benefits Among Healthcare Professionals. Summary of Two Years of Activity

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Research Article

Keywords: Academic promotion, Research skills, Scientific writing, Burnout, Academic accelerator

Posted Date: November 1st, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10972732/v1

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Additional Declarations: No competing interests reported.

Abstract

Background. Scientific research, academic writing, publication, and promotion rely on skills rarely taught in undergraduate medical education. However, are essential for career development and may significantly affect academic engagement and professional burnout.

Methods. We established the “Academic Accelerator,” a structured program designed to support such clinicians enabling acquisition of essential research and publication skills through hands-on, project-based learning, supported by institutional guidance.

Results. Of 30 projects, most matured within 12 months and resulted in publications in peer-reviewed journals. Participants were diverse: physicians and healthcare professionals across a broad range of ages. Projects involved approximately 150 active participants, 300 group meetings, and 900 hours of independent work. On average, each participant dedicated 40 hours to the program, while project management required about 15 hours per week, and publication costs averaged $1,500 per article. Institutional support included workshops in research methodology, statistics, and scientific writing. A validated questionnaire revealed that prior research experience was not significantly associated with improvements in research skills, burnout reduction, or organizational belonging. In contrast, improvement in formulating a research question was strongly correlated with gains in writing the scientific background, overall article writing, and statistical understanding (all $p < 0.001$). Strong intercorrelations were observed among writing scientific background, overall writing skills, and statistical comprehension, suggesting that research competencies improve as an integrated skill set. Improvements in each research skill were significantly associated with lower burnout levels ($p < 0.001$) and with a stronger sense of organizational connection ($p < 0.001$). Reduced burnout was moderately associated with increased organizational belonging ($\rho = 0.521$, $p < 0.001$).

Conclusion. The Academic Accelerator serves as a scalable model for developing research and publication skills among healthcare professionals. Acquiring these skills is associated not only with increased academic productivity, but also with reduced burnout and enhanced organizational engagement.

Background

Accelerated physician burnout as a global challenge.

Physician burnout is far from a minor professional obstacle; it is a global crisis that endangers both physicians as individuals – with devastating effects such as depersonalization and emotional exhaustion – and the entire healthcare system [1]. The concept of physician burnout emerged in the late 1960s as the emotional and psychological stress experienced by clinicians [2] and was further developed in the 1980s by Maslach et al. to encompass a broader scope: a combination of emotional exhaustion, depersonalization, and low personal accomplishment caused by the chronic stress of medical practice [3]. Studies on the prevalence of burnout in the medical community show considerable variation, reflecting differences in research methodologies and definitions. A 2018 systematic review by Rotenstein et al. [4] reported prevalence rates of 67.0% for overall burnout, 72.0% for emotional exhaustion, 68.1% for depersonalization, and 63.2% for low personal accomplishment. Other studies estimate a prevalence of approximately 50% [5]. These discrepancies are further highlighted by the use of at least 142 unique definitions to describe burnout or its subscales, underscoring the need for standardized measurement approaches. Despite this variability, the evidence consistently shows that burnout is a significant and growing concern – one likely to intensify as populations age and the demand for healthcare services continues to rise.

Strategies intended to mitigate the physician burnout crisis.

To address the physician burnout crisis, the literature highlights that both individual-focused interventions and organizational strategies is significantly reducing burnout among physicians [6]. Physician-directed interventions include mindfulness-based stress reduction, educational programs to improve self-confidence and communication skills, and

incorporating physical exercise. Organization-focused strategies involve workload adjustments, such as reducing hours and improving scheduling, fostering teamwork through discussion meetings, enhancing leadership, implementing structural changes, and offering training in communication and mindfulness practices [7]. A meta-analysis published in 2022 indicated that leaders of healthcare organizations must mitigate physician burnout using various evidence-based approaches, including those targeting low professionalism among hospital residents [8]. Several authors emphasized the importance of engagement as a counterbalance to the burnout phenomenon [9, 10]. For example, physician engagement in active research was advocated as an anti-physician burnout tool during the COVID-19 pandemic in Nova Scotia [11].

Academic literacy as a mean for minimizing physician burnout.

Academic literacy is a vital competency for physicians, significantly influencing their professional growth and ability to deliver optimal patient care. Although academic literacy and active research can be demanding, they have also been identified as possible methods to mitigate physician burnout and increase career satisfaction [12, 13]. A study by Norvell et al. identified specific nonclinical academic activities, such as research, leadership, teaching, and mentorship, as potential protective factors against burnout in emergency physicians [13]. Furthermore, a meta-analysis of over 7,700 physicians from the Veterans Affairs Association found that physicians actively engaged in research were more satisfied [14].

Aim of the current project.

In view of the aforementioned, fostering research and scientific writing skills among clinicians is assumed to be a proactive approach to addressing physician burnout by promoting personal fulfillment and professional growth. This article presents an overview of the "Academic Accelerator" project, a methodologically designed group initiative implemented at a tertiary medical center, highlighting its outcomes and impact over a two-year period.

Methods

The Academic Accelerator: Participants.

Participants of the “academic accelerator” are intentionally diverse in terms of age, seniority, and clinical discipline. Relating age, the program includes younger participants, such as high school students working on research baccalaureate projects as part of our clinical, epidemiological, and computer science–-based groups. In addition, medical students at various stages of their education – from early to advanced years – are encouraged to participate. The program also welcomes sub-interns, interns, residents, and senior physicians, creating multidisciplinary and intergenerational learning environment within the accelerator groups.

The Academic Accelerator: Process.

Teamwork throughout the research and scientific writing process can be described as progressing along two parallel timelines: the communication timeline, which keeps the group working together despite coming from different locations and having different work and study routines, and the production timeline, which enables collaborative efforts, practice, and the acquisition of necessary competencies during the production process. These two timelines are shown in Fig. 1.

The Academic Accelerator: Relevant competencies.

The initial relevant competencies identified as fundamental for the Academic Accelerator focused on conducting epidemiological research, with the understanding that they could later be adjusted to fit other research patterns. Figure 2 describes the chain of competencies categorized according to the key domains: research design, research authorization, data mining, data analysis, manuscript writing, and article publishing.

Formulating the research question.

Team members are trained in the fundamental principles necessary for effective research question formulation, which include: 1) Ensuring that all assumptions have a substantiated biological basis; 2) Creating research question with the potential to provide insights that benefit modern medicine; 3) Defining achievable endpoints that are feasible with reasonable resources constrains, including time and number of patients; 4) Verifying relevant data availability for analysis; 5) Ensuring appropriate analytic tools to address the main research question; 6) The research should have high potential for professional and public interest, with a strong likelihood of publication in journals with significant impact factors, specifically those ranked in the top Q1 to Q2 quartiles of the discipline.

Literature review and background writing.

Relevant competencies in this aspect of teamwork include: 1) Gathering and reviewing literature using PubMed and other relevant resources; 2) Integrated writing with citation management software; 3) Intermittent use and consultation of available generative AI algorithms, without incorporating AI-generated text into the manuscript.

Submission of research authorization by an IRB (Institutional Review Board)

Participants in the academic accelerator are encouraged to complete the GCP (Good Clinical Practice) course to be eligible for registration in our institutional software (Matarot Inc.), which enables submissions to our institutional review board (IRB). The skills needed for submission are mainly related to bureaucratic knowledge, and these are demonstrated to participants through the actual submission process.

Data Mining

At our medical center, specially designed software enables rapid and efficient data mining from the medical center's Electronic Medical Records (EMR). The MD Clone software allows mining of synthetic data – a data set that does not reveal real patient information – prior to IRB approval, giving researchers the ability to estimate the sample size and gain preliminary insights for further data analysis. This process enables researchers to address research questions instantly, without having to delay data mining and analysis until formal IRB approval is granted. Coded, anonymized data can be used before IRB approval, followed by real data mining after final approval is obtained. The skill of utilizing MD Clone can be taught to all healthcare professional within the medical center; however, many do not use this powerful tool unless it is demonstrated to them during accelerator meetings. Several physicians in our center have gained exceptional proficiency in the application of MD Clone and serve as "honorable members" in many accelerator research groups, sharing their expertise and advancing collaborative research efforts.

Data Analysis

Like data mining, data analysis is practiced by only a small proportion of physicians. The epidemiology and statistics courses typically completed during undergraduate studies, are often insufficient to develop the skills needed to perform even the basic descriptive and analytic functions of SPSS, RStudio, or Python compilers. As a result, those with expertise in these platforms share their knowledge by demonstrating and teaching other members of the accelerator, giving anyone interested in statistics the opportunity to become self-taught in these analytical platforms.

Manuscript writing

The process of manuscript writing can be categorized into two types of text: technical writing, which includes sections describing statistical methods and numerical results (especially those requiring tables), and analytical writing, which interprets the literature and is more descriptive (such as the background and discussion sections). All group members

participate in writing both types of text. These competencies can be developed by reading various types of manuscripts or by writing them. The accelerator prefers the latter approach. Writing data and explanatory texts related to one's specific research question is highly engaging and is believed to be effective preparation for future manuscripts.

Manuscript editing and proofreading

As required by nearly all scientific journals, authors are required to declare their specific roles and contributions to the manuscript at every stage of its creation. Therefore, all group members participate in both the initial drafting of the text and the subsequent proofreading process prior to submission.

Submission for publication

Although considered a technical aspect, the process of submitting a manuscript for publication is an essential set of competencies clinical researchers must acquire. Choosing the right journal, understanding terms such as impact factor, quartile classification of journals, H-Index, and more are all essential topics to which accelerator members are exposed. Accepting the responsibility to pay for “open access” rights is also important for their future publications.

The Academic Accelerator: Resources.

Analysis of the first 30 projects conducted by the Academic Accelerator of the Sheba Education Authority highlights the scope of human, temporal, and financial resources required for programmatic success.

Human Resources.

Each accelerator group consists of an average of eight participants at initiation, with approximately five remaining actively engaged through project completion. Participants include clinicians (at various stages), medical students, nurses, and other health professionals. Hybrid support is necessary, with project managers and academic mentors providing weekly logistical coordination, academic guidance, and troubleshooting. In addition to group members, leadership and administrative staff oversee accelerator supervision, investing an additional 1–2 hours per week supervising each cohort.

Time Resources.

For each project, ten structured group meetings are held, each lasting one hour, totaling 10 hours of synchronous meetings per project. In addition, each participant contributes approximately six hours of focused offline work, including data analysis, literature review, manuscript drafting, editing, and submission activities. Managerial and mentoring duties require an additional 1–2 hours per week throughout the project’s duration. The accelerator follows a high-frequency schedule, operating every evening from Sunday through Thursday for 1–2 hours, with an additional session during the week.

Financial Resources.

Primary financial costs are associated with article publication, estimated at an average of 1,500 USD per manuscript (Tables 1 & 2). Additional expenditures support digital infrastructure (video conferencing tools, statistical software), administrative services, and professional consultation (statistical, methodological, editorial).

Table 1
Summary of Resource Allocation (Per Project).

Category	Details (average)	Time Required (Hours)	Cost (USD)
Participants	8 at initiation → 5 at completion	—	—
Meetings	10 group meetings × 1 hour	10 hours	—
Offline Work	6 hours × 5 participants	30 hours	—
Managerial Oversight	1–2 hours/week × ~10 weeks	~ 15 hours	≈ 2,200
Publication	Per manuscript	—	≈ 1,500
Total time and costs		55 hours	≈ 3,700

Table 2
Summary of Total Resources Required for 30 Projects.

Category	Details	Time Required (Hours)	Cost (USD)
Participants	5 engaged × 30 projects = 150 participants	—	—
Meetings	10 meetings × 30 projects = 300 group meetings	300	—
Offline Work	6 hours × 5 participants × 30 projects	900	—
Managerial Oversight	1–2 hours × 10 weeks × 30 projects	450	≈ 67,000
Publication	1,500 USD × 30 manuscripts	—	≈ 45,000
Total time and costs		1,650	≈ 112,000

In summary, the successful operation of 30 Academic Accelerator projects required the active engagement of approximately 150 unique participants, 300 group meeting hours, 900 collective hours of offline research, writing, and analysis, at least 450 hours of dedicated managerial and mentoring input. Additionally, direct publication expenditures total approximately 45,000 USD.

Study tool.

Appreciation of the subjective impact the project had on participants was assessed using a designated questionnaire (English version included as supplement A). All participants signed an informed consent upon answering the research questionnaire. Table 3 presents the validation outcomes conducted to ensure to reliability and accuracy of the questionnaire. Data analysis was performed by R software, version 4.5.0.

Table 3
Validation of study questionnaire.

Category	Test	What Is This Test?	Test aim	Result	Interpretation
RELIABILITY	Cronbach's Alpha	Measures internal consistency - do all items work together as a unified scale?	To verify all items measure the same construct and the scale is reliable and consistent	0.875	Excellent reliability
FACTOR ANALYSIS FEASIBILITY	Kaiser-Meyer-Olkin (KMO)	Tests if sample size is adequate and correlations are strong enough for factor analysis	To confirm whether enough data and adequate correlations justify doing factor analysis	0.846	Very good sample adequacy
	Bartlett's Test of Sphericity	Tests if correlations between items are statistically significant (not random)	To prove that correlations are not random chance - validates using factor analysis	$\chi^2 = 415.05$, $p < .001$	Factor analysis appropriate
FACTOR STRUCTURE	Number of Factors Extracted	Reveals how many underlying dimensions/factors exist in your data	To understand if scale measures one construct (unidimensional) or multiple sub-dimensions	1 (unidimensional)	Unidimensional structure
	Total Variance Explained	Shows how much variance in responses is explained by the extracted factor(s)	To show how well the factor model captures and represents the data	54.6%	Adequate variance explained
	Factor Loadings Range	Shows how strongly each item correlates with its factor and the score	To identify which items are strong indicators vs. weak indicators of the construct	0.517–0.907	Strong factor loadings
ITEM QUALITY	Item-Total Correlations Range	Measures how well each item correlates with the total scale score	To detect problematic items that do not fit well with the rest of the scale	0.511–0.850	All items contribute well
SCALE DISCRIMINATION	Floor Effect	Percentage of respondents scoring at the minimum (all 1s) - tests if scale is too hard	To ensure scale has appropriate difficulty (not everyone scoring minimum)	0.8%	Acceptable
	Ceiling Effect	Percentage of respondents scoring at the maximum (all 5s) - tests if scale is too easy	To ensure scale discriminates well (not everyone scoring maximum)	10.2%	Acceptable

The questionnaire underwent comprehensive psychometric evaluation to assess its reliability and structural validity. First, internal reliability was assessed using Cronbach's alpha, which showed very high reliability ($\alpha = 0.875$), indicating excellent internal consistency among all items in the index. To assess the suitability for factor analysis, the Kaiser-Meyer-Olkin (KMO) index was calculated and found to be high (0.846), demonstrating sufficient relationships among the items and an appropriate sample for factor analysis. Bartlett's Test of Sphericity was highly significant ($\chi^2 = 415.09$, $p < 0.001$), indicating

that the correlations among items are not random and support further examination of the questionnaire's structure. Exploratory factor analysis revealed a one-dimensional structure, with only a single factor extracted, representing a uniform and consistent measurement of the trait. This single factor explained 54.9% of the total variance, which is considered sufficient for psychometric scales in the social sciences. The factor loadings were strong (0.517–0.907), indicating that all items contributed significantly to the overall index. Additionally, item–total correlations ranged from 0.611 to 0.850, showing that all items fit well within the scale structure and that there were no problematic items. The questionnaire's ability to avoid floor and ceiling effects was also analyzed. The percentage of respondents reporting the absolute minimum score was low (0.8%), and the percentage reaching the maximum score was only 10.2%. Both values fall within the accepted ranges, indicating no significant floor or ceiling effects. These findings confirm that the questionnaire is sensitive to natural variation among participants and can identify different response patterns without bias from scale extremes. Overall, all indicators show that the questionnaire is reliable, valid, one-dimensional, and possesses high-quality measurement characteristics suitable for research applications.

Results

After two years of activity, 30 projects could be summarized as presented in Table 4.

Table 4
summary of research and publication characteristics, the first 30 projects.

Project number	Clinical discipline	Research methodology	Participants	Time frame (months)	Q	Scientific publication
1	Infectious Diseases / Telemedicine	Case series	2 students, 1 intern, 2 senior physicians	12	2	Care of patients with bacteremia in the setting of a telemedicine-controlled hospital-at-home service is effective and safe: A case-series of 28 patients. Medicine (Baltimore). 2025;104(19):e42285.
2	Medical Education / Neurology	Descriptive study	1 resident, 1 administrator, 5 senior physicians	9	2	Increasing Medical Students Clinical Training Capacity Through the Establishment of Dedicated, Academic Out-patients' Clinics. The Case of NAC-Neurology Academic Clinic in a Tertiary Medical Center. J Med Educ Curric Dev. 2025;12.
3	Hematology / Endocrinology	Cross-sectional study	1 resident, 7 students, 4 senior physicians	7.5	2	Past use of metformin is associated with increased risk of myelodysplastic syndrome development in diabetes mellitus patients: a cross-sectional study of 54,869 patients. BMC Pharmacol Toxicol. 2025;26(1):45.
4	Radiology / Internal Medicine / AI	Prospective observational study	3 students, 4 senior physicians, 1 nurse	9	3	Consensus Between Radiologists, Specialists in Internal Medicine, and AI Software on Chest X-Rays in a Hospital-at-Home Service: Prospective Observational Study. JMIR Form Res. 2024;8:e55916.
5	Medical Education / Psychology	Intervention study	1psychologist, 1 administrator, 1 intern, 2 students, 1 senior physician	12	1	Combined empowerment, continuous appraisal, psychological and career counseling improve medical cadets' satisfaction and may potentially offset burnout during internship year. Front Public Health. 2024;12.
6	Oncology / Nephrology	Retrospective analysis	3 senior physicians, 2 residents, 1 student	6	1	Low Serum Alanine Aminotransferase Blood Activity Is Associated with Shortened Survival of Renal Cell Cancer Patients and Survivors: Retrospective Analysis of 1830 Patients. J Clin Med. 2024;13(19):5960.
7	Endocrinology /	Retrospective study	1 student, 3 senior	6	1	Comorbid Hypothyroidism and Low-Alanine

Project number	Clinical discipline	Research methodology	Participants	Time frame (months)	Q	Scientific publication
	Geriatrics		physicians			Aminotransferase-Associated Sarcopenia Associated with Shortened Survival: A Retrospective Study of 16,827 Patients over a 21-Year Period. J Clin Med. 2024;13(19):5838.
8	Emergency Medicine / AI	Retrospective big-data analysis	3 senior physicians, 1 data scientist, 7 students Ben-	12	1	Combination of machine learning algorithms with natural language processing may increase the probability of bacteremia detection in the emergency department: A retrospective, big-data analysis of 94,482 patients. Digit Health. 2024.
9	Pulmonology / AI	Model development study	1 computer science student, 1 computer science senior scientist, 4 senior physicians	12	1	Early Detection of Pulmonary Embolism in a General Patient Population Immediately Upon Hospital Admission Using Machine Learning to Identify New, Unidentified Risk Factors: Model Development Study. J Med Internet Res. 2024;26:e48595.
10	Infectious Diseases / Telemedicine	Case series	5 students, 3 senior physicians	5	3	Safe and Effective Treatment of Patients with Urinary Tract Infections Caused by Extended-Spectrum Beta Lactamase-Producing Enterobacteriaceae via Telemedicine-Controlled Hospital at Home: A Case Series of 11 Patients. Reports (MDPI). 2024;7(2):31.
11	Oncology / Urology	Retrospective data analysis	1 resident, 4 senior physicians	9	2	Low Alanine Aminotransferase as a Marker for Sarcopenia and Frailty, Is Associated with Decreased Survival of Bladder Cancer Patients and Survivors-A Retrospective Data Analysis of 3075 Patients. Cancers (Basel). 2023;16(1):174.
12	Cardiology / Telemedicine	Prospective validation study	4 students, 4 senior physicians, 2 nurses	15	2	Six-Lead Electrocardiography Enables Identification of Rhythm and Conduction Anomalies of Patients in the Telemedicine-Based, Hospital-at-Home Setting: A Prospective Validation

Project number	Clinical discipline	Research methodology	Participants	Time frame (months)	Q	Scientific publication
						Study. Sensors (Basel). 2023;23(20):8464.
13	Medical Education / AI	Pilot study	6 senior physicians, 2 residents, 2 administrators	5	1	Advantages and pitfalls in utilizing artificial intelligence for crafting medical examinations: a medical education pilot study with GPT-4. BMC Med Educ. 2023;23(1):772.
14	Internal Medicine / Telemedicine	Observational study	1 student, 9 senior physicians	14	1	Interpretation of Heart and Lungs Sounds Acquired via Remote, Digital Auscultation Reached Fair-to-Substantial Levels of Consensus among Specialist Physicians. Diagnostics (Basel). 2023;13(19):3153.
15	Cardiology / Geriatrics / Telemedicine	Retrospective analysis	4 students, 4 senior physicians, o 1 nurse	9	3	Occult myocardial injury is prevalent amongst elderly patients in the hospital-at-home setting: A retrospective analysis of 213 patients. Int J Cardiol Cardiovasc Risk Prev. 2023;19:200215.
16	Hematology / Oncology	Retrospective cohort study	1 resident, 2 students, 1 senior physician	9	2	Low Alanine-Aminotransferase Blood Activity Is Associated with Increased Mortality in Chronic Lymphocytic Leukemia Patients: A Retrospective Cohort Study of 716 Patients. Cancers (Basel). 2023;15(18):4606.
17	Oncology / Urology	Retrospective cohort study	2 residents, 4 senior physicians	10	1	Low Alanine Aminotransferase, as a Marker of Sarcopenia and Frailty, Is Associated with Shorter Survival Among Prostate Cancer Patients and Survivors. Eur Urol Open Sci. 2023;55:38–44.
18	Infectious Diseases / Geriatrics	Retrospective cohort study	1 student, 6 residents, 4 senior physicians	7	2	Do low levels of alanine aminotransferase, a baseline marker of sarcopenia and frailty, associate with worse clinical outcomes among hospitalized COVID-19 patients? sa. 2023;8(3):148–154.
19	Hematology	Retrospective study	1 student, 2 residents, 3 senior physicians	7	2	Low ALT, a marker of sarcopenia and frailty, is associated with shortened survival amongst myelodysplastic syndrome patients: A retrospective study. Medicine

Project number	Clinical discipline	Research methodology	Participants	Time frame (months)	Q	Scientific publication
						(Baltimore). 2023;102(17):e33659.
20	Internal Medicine/Pulmonology/ Hematology	Retrospective analysis	8 students, 2 senior physicians	12	2	Profound anemia in hospitalized community acquired pneumonia patients is associated with increased mortality and is prevalent in all patients' age groups. a retrospective analysis of 15,121 patients. BMC Infect Dis. 2025; Oct 13;25(1):1297.
21	Internal Medicine / Geriatrics	Retrospective cohort study	7 students, 3 senior physicians	14	1	Association between magnesium level during hospitalization and venous thromboembolism (VTE) up to 30 days after hospitalization in acutely ill, hospitalized patients, 65 to 90 years old. a retrospective cohort analysis of 6,428 patients. BMC Geriatr;2025 Nov 18;25(1):922.
22	Ear, Nose and Throat	Retrospective cohort study	4 residents, 2 students, 3 senior physicians	12	2	Low Alanine Aminotransferase Blood Activity, a Biomarker of Sarcopenia and Frailty, is Associated With Worse Post-Total Laryngectomy Clinical Outcomes. A Retrospective Analysis of 427 Patients. Clin Otolaryngol; 2025 Dec 1.
23	Internal / emergency medicine.	Retrospective cohort study	2 students, 1 intern, 3 senior physicians	14	2	Fever and hypotension vs. frank septic shock: Elderly patients taking vasodilators who present with fever and hypotension have a higher incidence of negative blood cultures. A retrospective analysis of 3,726 patients. Am J Med Sci; 2025 Nov 5:S0002-9629(25)01267-4.
24	Obstetrics / Gynecology	Retrospective comparative analysis	2 students, 3 residents, 5 senior physicians	8	2	Spontaneous Abortion During Wartime: A Retrospective Comparative Study. Isr Med Assoc J;2025 Jul;27(7):419–423.
25	Medical informatics	Review	1 students, 3 administrators, 2 senior physicians	5	1	A blockchain-based computerized network infrastructure for the transparent, immutable calculation and dissemination of quantitative, measurable parameters of academic

Project number	Clinical discipline	Research methodology	Participants	Time frame (months)	Q	Scientific publication
						and medical research publications. Digit Health;2023 Aug 21:9:20552076231194851.
26	Obstetrics / Metabolic Medicine	Retrospective cohort study	4 residents, 4 senior physicians	10	NA	Maternal Hypertriglyceridemia and the Risk of Pre-Eclampsia: Predictors and Contributing Factors. et al. submitted to publication.
27	Obstetrics / Gynecology	Retrospective study	4 residents, 4 senior physicians	7	NA	Low Maternal Serum Phosphorus Is Associated with Increased Risk of Postpartum Hemorrhage. submitted to publication.
28	Internal Medicine / Intensive Care	Retrospective analysis	1 intern, 3 students, 2 senior physicians	10	NA	Vasopressor Therapy for Patients Suffering from Septic Shock Does Not Increase the Risk of In-Hospital Amputation: A Retrospective Analysis of 4,468 Patients Demonstrating the Need for Personalized Therapy. submitted to publication.
29	Medical Education / Artificial Intelligence	Experimental study	2 students, 1 psychologist, 1 senior physician	11	NA	Generative Pre-trained Transformer (GPT) Algorithm Can be Taught to Improve the Task of Differential Diagnosis According to Simple Principles of Clinical Reasoning: The Case of GPT-4o and a Lesson to Apply in Medical Education. Submitted to publication.
30	Internal Medicine/ Nephrology	Retrospective Analysis	3 students, 2 interns, 2 senior physicians	12	NA	Chronic Lithium Therapy Can be Associated with Serum Electrolyte Anomalies Regardless of Renal Function or Diagnosis of Arginine-Vasopressin Resistance (AVP-R). A Retrospective Analysis of 1,150 Patients. Submitted to publication.

Table 5 summarize the questionnaires results.

Table 5
Cohort characteristics and questionnaire results

Variables	Overall [n = 127]	F [n = 78]	M [n = 49]	P-value
Age (years); N (%)				
Up to 20	6 (4.7)	3 (3.8)	3 (6.1)	0.25
20–30	51 (40.2)	36 (46.2)	15 (30.6)	
30–45	60 (47.2)	32 (41)	28 (57.1)	
45+	10 (7.9)	7 (9)	3 (6.1)	
Role; N (%)				
Attending physician	17 (13.4)	12 (15.4)	5 (10.2)	0.978
Resident	14 (11)	8 (10.3)	6 (12.2)	
Medical intern	24 (18.9)	15 (19.2)	9 (18.4)	
Medical student	57 (44.9)	34 (43.6)	23 (46.9)	
Nurse	3 (2.4)	2 (2.6)	1 (2)	
High school student	6 (4.7)	3 (3.8)	3 (6.1)	
Other	6 (4.7)	4 (5.1)	2 (4.1)	
Research experience (years; median [IQR])	2 [1, 3]	2 [1, 3]	2 [1, 3]	0.983
Prior skills citation management; N (%)	49 (38.6)	28 (35.9)	21 (42.9)	0.55
Improved skill research question (median [IQR])	4 [3, 5]	4 [3, 5]	4 [3, 5]	0.971
Improved skill scientific background (median [IQR])	4 [3, 5]	4 [3, 5]	4 [3, 5]	0.657
Improved skill statistical analysis understanding (median [IQR])	3 [2, 4]	3 [2, 4]	4 [3, 5]	0.055
Improved skill article writing (median [IQR])	4 [3, 5]	4 [3, 5]	4 [3, 5]	0.494
Reduced burnout (median [IQR])	4 [3, 5]	4 [3, 5]	3 [3, 4]	0.656
Improved feeling of connection to Sheba (median [IQR])	5 [4, 5]	5 [4, 5]	5 [4, 5]	0.331
Interest in further participation; N (%)	124 (97.6)	75 (96.2)	49 (100)	0.283
Would you recommend to a friend; N (%)	126 (99.2)	77 (98.7)	49 (100)	1

A total of 127 participants completed the research questionnaires. Most were between 30 and 45-years old (n = 60, 47%) and reported limited prior research experience (on a Likert scale of 1 to 5, the median was 2 [IQR 1, 3]). None of the background demographic variables differed significantly between males and females. Regarding outcome measures, the rate of improvement in the skill of research question determination was high (median 4 [IQR 3, 5]), as was the rate of improvement in scientific background writing (median 4 [IQR 3, 5]).

The self-reported reduction in burnout was high (median 4, IQR 3–5), as was the rate of improved feelings toward the organization (median 4, IQR 3–5). Most participants, 124 (97.6%) were interested in future participation in the project, and 126 (99.6%) would recommend the program to their peers. Similar to demographic results, satisfaction and burnout parameters did not differ significantly between males and females.

Correlation tests (Spearman's Rho) revealed that prior research experience was not associated with statistical significance, with any of the study questionnaire parameters (all correlations were in the range of ρ = -0.03 to + 0.09, p > 0.3). In contrast, improvements in individual research domains were strongly and significantly interrelated: improved ability to compose a research question was highly correlated with improvement in writing a scientific background (ρ = 0.689) and manuscript writing skills (ρ = 0.698), as well as with better understanding of statistical analysis methodologies (ρ = 0.561), all statistically significant (p < 0.001). Even stronger associations were found between improved ability to write a scientific background and scientific writing as a whole (ρ = 0.828), and between better understanding of statistical analysis methodologies and manuscript writing skill (ρ = 0.680), all statistically significant (p < 0.001). These findings suggest that research skills tend to improve as an interconnected set of abilities.

Improvement in research skills was also significantly associated with lower reported levels of burnout. The associations ranged from moderate to moderately strong (ρ = 0.410–0.508, p < 0.001), indicating that improvement in overall research ability was associated with a reported decrease in burnout. In addition, improvement in research skills was moderately positively correlated with a stronger sense of connection to the organization (Sheba), with correlations ranging from ρ = 0.411 to 0.457 (all p < 0.001). Finally, a moderately strong and significant association was found between a decrease in burnout and an increase in the sense of connection to the organization (ρ = 0.521, p < 0.001). This pattern of relationships indicates that improvement in research skills is not only technical but is also accompanied by improvement in significant emotional and organizational indicators, including reduced burnout and increased organizational involvement.

Discussion

The findings from this two-year evaluation of the Academic Accelerator demonstrate that structured, mentored, and collaborative research training can substantially strengthen research competencies among healthcare professionals while also reducing burnout and enhancing organizational engagement. Alongside with endowing research competencies, project participants also enjoyed networking with peers and advancing their future academic promotions.

Our findings align with previous literature describing both the increasing prevalence of physician burnout and the potential for academic engagement to serve as a protective factor against emotional exhaustion, depersonalization, and diminished personal accomplishment.

Clinician burnout remains a persistent global challenge, with prevalence estimates frequently reported between 50 and 70%, depending on measurement tools and population characteristics. The literature highlights that drivers of burnout stem not only from overwhelming workloads and system pressures but also from insufficient developmental opportunities, poor academic integration, and a lack of recognition or professional fulfillment. Addressing this challenge, the current project was designed to provide a structured, institution-supported path for developing research literacy, academic writing skills, and scholarly productivity – factors previously identified as contributing to greater work satisfaction and reduce burnout rates.

The methodology of the Academic Accelerator was intentionally designed to address key gaps in research training. First, the heterogeneity of participants, ranging from high school research students to senior physicians across diverse specialties, enabled a cross-disciplinary learning culture that fostered mentorship, skill reciprocity, and shared accountability. Second, the dual-timeline structure for communication and production created predictable, iterative progress points, which are essential in environments where clinical workloads often impede continuous academic work. Third, the program's stepwise competencies, covering research question formulation to data analysis and manuscript preparation, provided a comprehensive academic literacy framework rarely taught during medical training.

Several methodological features appear to have been particularly impactful. Incorporating project-based learning ensured that participants developed skills in real time, grounded in authentic research questions with clinical importance. Using MD Clone software to generate preliminary synthetic data allowed groups to begin exploratory analysis before IRB approval, reducing delays and maintaining project momentum – an important innovation for clinician-researchers with fragmented

time availability. Additionally, the group-based manuscript writing model enabled participants to experience both analytical and narrative scientific writing, promoting deeper engagement with the publishing process.

Our findings strongly validate the program's effectiveness. Nearly all participants reported measurable improvements in multiple research competencies, including research question development, background writing, statistical understanding, and manuscript writing. Importantly, these improvements were independent of participants' prior research experience, suggesting that the accelerator model is accessible and beneficial even for individuals with minimal research background or literacy. Furthermore, the strong intercorrelations observed across research skills indicate that competency development functions as an integrated process: as participants improve in one domain, advancement in complementary areas.

A key contribution of this study is demonstrating that skill acquisition in research is strongly associated with emotional and organizational benefits. Improvements in research competencies were strongly associated with reductions in burnout and increases in organizational sense of belonging. These findings align with frameworks suggesting that professional growth, mastery, and academic autonomy can mitigate burnout by providing clinicians with greater self-efficacy, intellectual engagement, and a sense of meaningful contribution beyond routine clinical duties. Moreover, the moderate to strong correlation observed between reduced burnout and increased organizational connection further emphasizes the importance of institutional support structures in clinician well-being.

The outputs of the accelerator program, 30 mature projects within an average of 9 to 12 months, most published in high-ranking Q1 and Q2 journals – further highlight the scalability and productivity of this model. The scope of involvement, with approximately 150 active participants, and the substantial cumulative time investment, 300 meetings and 900 hours of offline work – reflect significant institutional commitment. Notably, the relatively modest direct financial costs, primarily from publication fees, suggest that such programs can be economically feasible for other institutions seeking to integrate academic development into their clinical environments.

This study has several notable strengths. It is among the few evaluations of a real-world implementations of a structured academic literacy program for physicians and allied health professionals. It combines objective productivity measures with validated psychometric assessments of participant perceptions. The heterogeneity of clinical disciplines enhances generalizability, and the program's alignment with institutional goals supports its long-term sustainability.

Limitations

Several limitations must be acknowledged. First, the study relies largely on self-reported improvements, which, despite the strong reliability and validity of the questionnaire, may be subject to bias. Second, the success of the accelerator depends partly on the availability of dedicated mentors and institutional research infrastructure; replication in smaller or resource-limited centers may require adaptation. Finally, though strong associations were observed between skill improvements and burnout reduction, the study design does not allow for causal inference. Future controlled or longitudinal studies are needed to determine whether academic engagement directly reduces burnout or if both are mediated by additional organizational or individual factors.

Conclusions

In summary, the Academic Accelerator demonstrates that structured, mentored, and collaborative research training can produce substantial academic outputs while supporting clinician well-being. By integrating skill development mentorship, cross-disciplinary collaboration, and practical research experience, this model offers a promising and scalable approach for institutions seeking to strengthen academic capabilities and mitigate burnout among healthcare professionals. Future studies should explore the long-term effects of such programs, their adaptability across different healthcare systems, and the mechanisms through which academic engagement supports professional fulfillment and organizational resilience.

Declarations

Data availability

Research data will be made available on reasonable request and include guidance on who should be contacted to provide access.

Consent to Publication

Not applicable.

Ethics declaration

All studies included in this research were approved by the Chaim Sheba Institutional Review Board according to the Helsinki Declaration. All participants signed an informed consent upon answering the research questionnaire.

Funding declaration

This research did not get any external fundings.

Authors contribution statement

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Resources: V.R.

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Writing – final version: V.R., G.S., Y.P., A.M., G.D., R.K.L., A.V., R.T., R.S.

Acknowledgements

None

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Figures

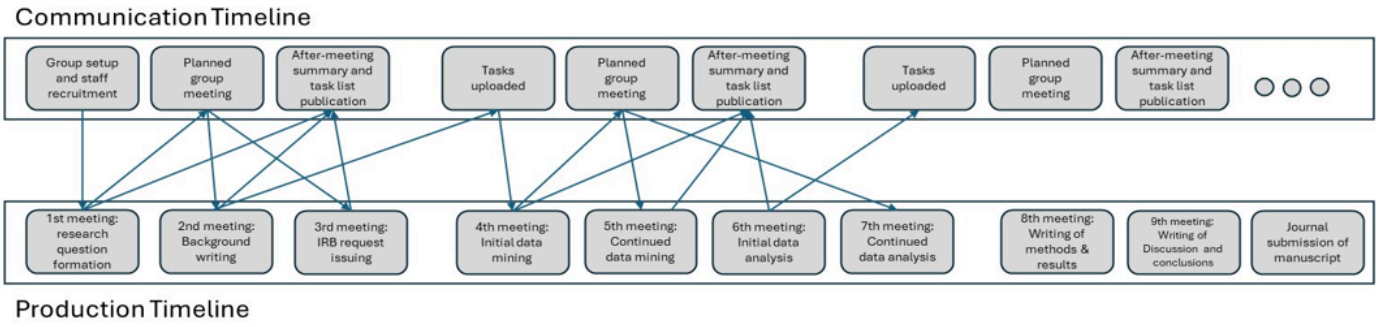


Figure 1

Two parallel timelines of communication and production.

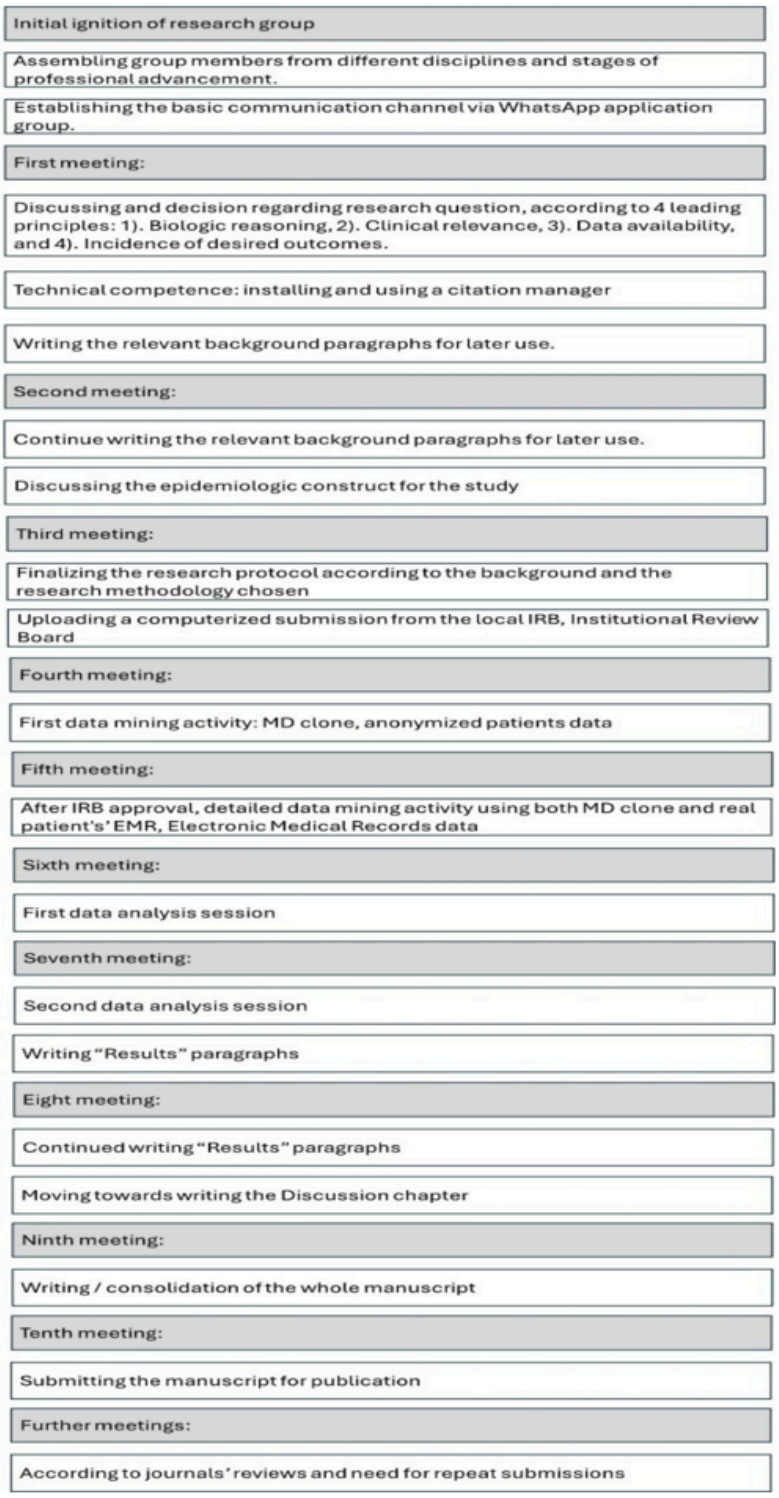


Figure 2

Relevant, sequential competencies for research, writing and publishing an academic article.

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