



PROJECT COMPLETION REPORT

Title: Addressing knowledge gap among health professionals in postgraduate training program through educational intervention for early diagnosis and treatment of hematological malignancies

Prepared by: Cancer Care Nepal

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ACKNOWLEDGMENT

We expresses our deepest gratitude to the American Society of Hematology (ASH) for their generous support through the Global Research Award 2022, which made this project— ***“Addressing Knowledge Gaps among Health Professionals in Postgraduate Training through Educational Interventions for Early Diagnosis and Treatment of Hematological Malignancies”***—a reality.

We are especially grateful to our Principal Investigator, Dr. Ramila Shilpakar, for her dedicated leadership and unwavering commitment to strengthening hematology-oncology education in Nepal. Our sincere appreciation also goes to our Local Mentor, Dr. Bishesh Poudyal, and Global Mentor, Dr. Rebecca Olin, whose expert guidance, strategic direction, and continued mentorship were pivotal throughout the project’s design, implementation, and evaluation.

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Cancer Care Nepal

EXECUTIVE SUMMARY

The American Society of Hematology (ASH) Global Research Award 2022 funded this two-year, multi-phase educational intervention project implemented by Cancer Care Nepal from July 2022 to June 2025. The project aimed to address critical knowledge gaps in the diagnosis and management of hematological malignancies among postgraduate medical trainees in Nepal.

Through a comprehensive approach combining baseline assessment, targeted educational interventions using the Project ECHO® model, and the development of a clinical decision support mobile application, the project successfully engaged over 150 Internal Medicine residents and faculty across 22 medical institutions nationwide.

Key achievements include:

- Gaps in hematology-oncology training were identified through a comprehensive assessment involving 256 respondents.
- Implementation of bi-monthly virtual educational sessions via ZOOM using the Project ECHO® model
- Multi-institutional collaboration and networking established to streamline approaches to hematological cases.
- Sensitization of relevant authorities in Nepal on the need to integrate hematology training into internal medicine programs.
- Preparation of academic publications for international dissemination

The project has successfully laid the foundation for improved early diagnosis of hematological malignancies in Nepal by equipping future physicians with enhanced knowledge, practical skills, and decision-support tools tailored to the local context.

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CHAPTER I: INTRODUCTION

1.1 Project Information:

Field	Details
Project Title	<i>Addressing Knowledge Gaps in Postgraduate Health Professional Training through Educational Interventions for Early Diagnosis and Treatment of Hematological Malignancies</i>
Grant Reference	American Society of Hematology Global Research Award 2022
Award Term	July 1, 2022 – June 30, 2025 (including approved extension)
Principal Investigator	Dr. Ramila Shilpakar
Local Mentor	Dr. Bishesh Poudyal
Global Mentor	Dr. Rebecca Olin
Implementing Organization	Cancer Care Nepal
Total Project Cost	NPR 17,890,600

1.2 Implementing Organization

Cancer Care Nepal (CCN) is a non-profit, non-governmental organization established in 2009 (2065 BS) and registered in Jawalakhel, Lalitpur, Nepal. CCN aims to reduce the national cancer burden through prevention, awareness, and healthcare workforce development. It has become a leading advocate for cancer education and care in Nepal through its core programs:

- Community cancer awareness and educational outreach
- Screening services targeting underserved populations, particularly for cervical cancer
- Counseling and referral support for confirmed cases
- Free cancer care services for ultra-poor patients through public hospital collaboration
- Palliative and end-of-life care
- Specialized training for medical professionals
- Partnerships with government and non-government stakeholders to strengthen cancer infrastructure

This project marks a significant expansion of CCN's educational portfolio, focusing on hematological malignancies—a critically underserved area in the Nepalese healthcare landscape.

1.3 Project Context and Background

Hematological malignancies, though less prevalent than solid tumors, pose a significant public health burden in Nepal. Late-stage diagnosis remains common, largely due to systemic delays, low clinical suspicion, and insufficient diagnostic capabilities.

Contributing factors include:

- Lack of training among frontline healthcare providers in early warning signs
- Minimal exposure to hematologic oncology in medical curricula
- Very few practicing haemato-oncologists nationwide
- Limited access to specialized diagnostics and referral pathways
- Pervasive misconceptions and therapeutic nihilism regarding blood cancers

Cancer has emerged as the third leading cause of non-communicable disease-related deaths in Nepal, accounting for nearly 9% of annual mortality. Yet, the diagnostic and treatment capacity for hematological malignancies remains severely underdeveloped.

1.4 Project Rationale

This project was designed to address these systemic challenges by equipping postgraduate medical trainees with enhanced knowledge and decision-making skills related to hematologic cancers. The underlying hypothesis was that strengthening medical education in this area would lead to:

- Earlier recognition of clinical warning signs
- Rational use of diagnostic tests
- Avoidance of inappropriate procedures (e.g., FNAC in suspected lymphoma)
- Timely referrals to specialized centers
- Improved patient outcomes

Targeting Internal Medicine residents and faculty members, the project sought to create a multiplier effect, empowering future physicians who will serve across Nepal—including in remote, underserved regions.

1.5 Project Objectives and Scope

The project was designed with five core objectives:

1. **Identify** knowledge gaps among postgraduate medical trainees regarding the diagnosis and management of hematological malignancies.
2. **Implement** a targeted educational intervention using the Project ECHO® model to improve clinical decision-making.
3. **Develop** a mobile application for clinical decision support, tailored to the Nepal context.
4. **Publish** research findings to inform future policy and education programming.
5. **Engage** the public via app-based awareness components related to blood cancers.

The intervention reached approximately 150 Internal Medicine residents and faculty members across multiple academic medical institutions in Nepal.

1.6 Implementation Framework and Timeline

The project followed a structured, phased approach:

Phase	Timeline	Key Activities
Phase 1: Assessment & Planning	July – Sept 2022	- Curriculum development for the training program - Research team training in Project ECHO methodology - Baseline knowledge assessment through comprehensive surveys - Identification of specific educational needs and priorities
Phase 2: Intervention Implementation	Sept 2022 – Dec 2023	- Educational intervention using the Project ECHO model - Case-based discussions and didactic sessions - Development of the mobile application for clinical decision support - Ongoing assessment and refinement of educational materials

Phase 3: Evaluation & Dissemination	Jan 2024 – June 2025	- Pilot testing and refinement of the mobile application - Post-intervention knowledge assessment - Data analysis and preparation of research publications - Dissemination of findings and final reporting
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1.7 Alignment with National Priorities

This initiative aligns with national and global health strategies:

- **Nepal’s 15th Periodic Plan:** Calls for expanded NCD services and specialized human resources.
- **National Health Policy 2071:** Promotes evidence-based practices and equitable access to healthcare.
- **SDG Goal 3:** Aims to reduce premature mortality from non-communicable diseases through prevention and early intervention.

1.8 Project Partners and Roles

Implementation was supported by a multidisciplinary collaboration:

- **Cancer Care Nepal (CCN):** Lead implementing agency overseeing operations and coordination
- **American Society of Hematology (ASH):** Funding and strategic guidance through the Global Research Award
- **Participating Medical Institutions:** Provided access to postgraduate trainees and facilitated in-person sessions
- **International and Local Mentors:** Delivered technical guidance and contextual case-based insights
- **Technology Partners:** Supported design and deployment of the clinical decision-support mobile app

This collaborative structure ensured both global best practices and local contextual relevance.

CHAPTER 2: PROJECT IMPLEMENTATION

Project Activity 2.1 Survey Approvals and Stakeholder Engagement

At the onset, approvals were obtained from the Nepal Health Research Council (NHRC) and the Social Welfare Council (SWC). A national orientation workshop was held on May 20, 2023, involving all 21 participating in medical colleges to introduce the project objectives, discuss the knowledge gap survey, and coordinate logistics. Institutional engagement was critical to ensuring the smooth rollout of the educational intervention and mobile app.

Project Activity 2.2 Hematology Current Status Survey

2.2.1 Activity Overview

The Hematology Current Status Survey was initiated to comprehensively evaluate the existing landscape of hematology and oncology education in Nepal. The survey aimed at:

- Assess the quality and availability of clinical rotations in hematology and oncology.
- Measure medical professionals' confidence in diagnosing and managing hematologic malignancies.
- Identify critical gaps in training infrastructure and educational resources.
- Evaluate interest in supplemental learning tools customized for the Nepalese context.

2.2.2 Methodology

- **Design:** A structured online questionnaire assessing training experience, clinical exposure, confidence levels, and resource availability.
- **Participants:** 256 complete responses collected nationwide.
- **Respondent Profile:** Primarily postgraduate residents (94%) from both government and private institutions.
- **Average Completion Time:** 22 minutes and 56 seconds.

2.2.3 Key Findings

Demographics

- **Age:** 92% of respondents were between 25–34 years old.
- **Gender:** 83% male, 16% female.
- **Professional Level:**
 - 1st-Year Residents: 35%
 - 2nd-Year Residents: 30%
 - 3rd-Year Residents: 30%
 - Faculty: 4%

- **Institution Type:**
 - Private Medical Colleges: 59%
 - Government Medical Colleges: 31%
 - Public Medical Colleges: 10%

2.2.4 Hematology Clinical Training

- **Mandatory Rotations:** Only 41% had access to mandatory hematology clinical rotations.
- **Specialist Availability:** 60% reported no hematologist at their institution.
- **Rotation Duration:** Most common length was 15 days to 1 month.
- **Teaching Methods:** Primarily inpatient rounds and outpatient clinics.
- **Curriculum Adequacy:** 57% felt hematology-oncology topics were inadequately covered.
- **Confidence Levels:** 42% reported feeling "Not Confident" when encountering suspected hematological malignancies

2.2.5 Medical Oncology Training

- **Mandatory Rotations:** 49% participated in oncology rotations.
- **Oncologist Availability:** 57% had access to oncology specialists.
- **Satisfaction:** 63% were dissatisfied with their oncology training experience.
- **Service Availability:** Limited access to specialized oncology services beyond basic care.

2.2.6 Transfusion Medicine

- **CME Access:** 82% reported no Continuing Medical Education sessions in transfusion medicine.
- **Blood Bank Rotation:** 87% did not have a scheduled blood bank rotation.
- **Protocols:** 51% lacked formal transfusion guidelines.
- **Blood Supply:** 63% reported frequent shortages of blood products.

2.2.7 Future Educational Needs

- **Training Importance:** 97% emphasized the importance of hematology training in postgraduate programs.
- **Learning Interest:** 98% showed interest in additional educational sessions on haemato-oncology.
- **Mobile Application:** 94% supported the idea of a diagnostic and treatment support app.
- **Career Aspirations:** 47% expressed interest in pursuing a career in hematology/oncology, while 41% were undecided.

2.2.8 Conclusions

The findings underscore critical gaps in Nepal's current hematology and oncology training landscape:

1. **Infrastructure Deficiencies:** Lack of access to specialists and structured rotations in most institutions.
2. **Training Inadequacies:** Incomplete curriculum coverage and insufficient clinical exposure.
3. **Confidence Deficits:** Significant number of respondents reported low confidence in diagnosing and managing hematologic cases.
4. **Strong Demand for Educational Tools:** Near-unanimous support for context-specific mobile learning tools and CME programs.

2.2.9 Recommendations

1. **Curriculum Reform:** Integrate standardized hematology-oncology modules into residency training programs.
2. **Rotation Expansion:** Establish mandatory rotations with clear learning objectives and mentorship.
3. **Digital Education Tools:** Develop a Nepal-specific mobile application to support diagnosis and treatment.
4. **Faculty Capacity Building:** Train medical educators to effectively deliver hematology and oncology instruction.
5. **Transfusion System Strengthening:** Implement standardized protocols and develop national hemovigilance systems.

2.2.10 Next Steps

1. **Educational Tool Development:** Commence development of the mobile app featuring diagnostic aids, guidelines, and treatment algorithms.
2. **Stakeholder Engagement:** Disseminate findings to national medical councils, universities, and relevant professional bodies.
3. **Implementation Planning:** Design and pilot standardized hematology training modules in select institutions.
4. **Monitoring and Evaluation:** Conduct a follow-up assessment in 12–24 months to track improvements and guide further interventions.

Project Activity 2.3 Educational Intervention Using Project ECHO

2.3.1 Activity Overview

Based on the identified knowledge gaps from the survey, a structured educational intervention was designed and implemented using the Project ECHO® (Extension for Community Healthcare Outcomes) model. This tele mentoring model was chosen for its proven effectiveness in democratizing specialized knowledge through case-based learning and interactive discussions.

2.3.2 Educational Design

The intervention was designed to address the specific areas of weakness identified in the baseline survey:

- **Format:** Bi-monthly virtual sessions (first and third Wednesday of each month)
- **Duration:** 90-minute sessions
- **Structure:**
 - Case presentations (40 minutes)
 - Didactic lectures (30 minutes)
 - Q&A and discussions (20 minutes)

2.3.3 Topics Covered

Sessions were organized around key themes in hematological malignancies, including:

1. Normal hematopoiesis and deviation from normal: development of hematological malignancies: Dr Ramila Shilpakar
2. Interpretation of peripheral blood smears examination.: Dr Sampurna Tuladhar
3. Bone marrow biopsy and bone marrow examination.: Dr Bishal Poudel
4. Approach to a case of Pancytopenia.: Dr Ramila Shilpakar
5. Anemia- approach and red flags in anemia to workup for malignant causes: Dr Bishesh Poudyal
6. Lymphadenopathy: Approach and when to suspect malignant cause: Approach to lymphoma.: Dr Soniya Dulal
7. Approach to splenomegaly.: Dr Rajeev Sharma

8. Lymphomas: how do we investigate and treat? Dr Bishal Poudel
9. Disorders of leukocytes: when to suspect acute Leukemias? Dr Bishesh Poudyal
10. Acute Leukemias: how do we investigate and treat? Dr Bishesh Poudyal
11. Myeloproliferative neoplasm: diagnosis / clinical manifestation and approach: Dr Anuj KC
12. Investigations and Treatment of Myeloproliferative Neoplasm: Polycythemia Vera/ PMF/ ET
13. Chronic Leukemias: CML /CLL: Dr Soniya Dulal
14. Myelodysplastic syndromes: Approach and treatment: Dr Anuj KC
15. Neutropenic fever: approach and management: Dr Rajeev Sharma
16. Disorders of platelets: approach and red flags to workup for malignant causes: Dr Bishal Poudel
17. Management of Thrombocytopenia : Dr Bishal Poudel
18. Multiple Myeloma – the must know as an internist: Dr Ramila Shilpakar
19. Treatment modalities of various hematological malignancies: Dr Ramila Shilpakar
20. Bone marrow and Stem cell transplantation: Dr Bishesh Poudyal
21. Transfusion medicine: Introduction : Dr Bipin Nepal
22. Coagulation disorders and malignancies: Dr Soniya Dulal
23. Eosinophilia – causes and approach in context of Nepal: Dr Ramila Shilpakar
24. Hemolytic Anemia and its association with malignancies.: Dr Anuj KC

2.3.4 Participation and Engagement

- Over 20 ECHO sessions conducted during the project period

- Average attendance of 85 participants per session
- Active participation from 22 medical colleges
- Interactive case discussions with real-time feedback from experts

2.3.5 Feedback and Impact

Participant feedback was collected after each session using standardized evaluation forms. Key findings include:

- 85% rated the sessions as "highly valuable" for clinical practice
- 78% reported improved confidence in approaching suspected hematological malignancies
- 92% expressed that the case-based format enhanced practical learning
- 89% indicated applying knowledge gained in their clinical settings

Project Activity 2.4 Development and Launch of "IM Hemonc Essentials" Mobile Application

2.4.1 Activity Overview

Based on the overwhelming support (94% of survey respondents) for a mobile application, the project developed "IM Hemonc Essentials" - a clinical decision support tool for the diagnosis and management of hematological malignancies tailored to the Nepal context.

2.4.2 Application Development Process

The application was developed following an Information Systems Research (ISR) framework, focusing on user needs through an iterative and collaborative process:

1. **Requirements Gathering:** Based on survey findings and expert input
2. **Content Development:** Created by hematology-oncology specialists
3. **Prototype Design:** User interface optimized for clinical workflow
4. **Testing and Refinement:** Pilot testing with target users
5. **Final Development:** Incorporation of feedback and optimization
6. **Launch and Deployment:** Release during the March 2025 workshop

2.4.3 Key Features

The application included several essential components:

For Healthcare Professionals:

- Diagnostic algorithms for common hematological presentations
- Treatment protocols adapted to the Nepal context
- Procedural guides (e.g., bone marrow aspiration/biopsy)
- "Must know" clinical pearls (e.g., avoiding FNAC in suspected lymphoma)
- Offline functionality for use in areas with limited connectivity

For Public Awareness:

- Early warning signs of blood cancers
- Patient education materials
- Referral guidance
- Myth-busting information

2.4.4 Implementation and Adoption

- Successfully launched during the March 2025 workshop
- 100% of workshop participants installed the application
- 92% demonstrated proficiency in using core features during hands-on training
- User feedback incorporated for future updates

Project Activity 2.5: Educational Workshop for Hematological Malignancies Knowledge Enhancement

Date: March 1, 2025

Venue: Cancer Care Nepal

Lead Facilitator: Dr. Ramila Shilpakar

Co-Facilitators: Dr. Bishesh Poudyal (Local Mentor), Dr. Rebecca Olin (Global Mentor)

2.5.1 Activity Overview

This in-person workshop was the culminating event of the *ASH Global Research Award 2022* project, titled: **"Addressing Knowledge Gaps in Postgraduate Health Professional Training through Educational Interventions for Early Diagnosis and Treatment of Hematological Malignancies."**

The workshop supplemented previous interventions—including virtual Project ECHO® sessions and the development of the "IM Hemonc Essentials" mobile application—by providing an interactive and hands-on learning environment.

2.5.2 Workshop Objectives

- Strengthening participants' understanding of hematology-oncology as a career subspecialty.

- Gather structured feedback on the Project ECHO® virtual learning series.
- Introduce and provide hands-on experience with the IM Hemonc Essentials mobile application.
- Conduct a social audit to evaluate the impact of educational interventions on clinical practice.

2.5.3 Participant Profile

The workshop engaged postgraduate Internal Medicine residents and faculty from **22 medical colleges across Nepal**, ensuring national representation. Participating institutions included:

1. Birat Medical College
2. BP Koirala Institute of Health Sciences
3. Chitwan Medical College
4. College Of Medical Sciences
5. Gandaki Medical College
6. Karnali Academy of Health Sciences
7. KIST Medical College
8. Kathmandu Medical College
9. Kathmandu University Medical School
10. Lumbini Medical College
11. Manipal College Of Medical Sciences
12. Nepalese Army Institute of Health Sciences
13. National Academy of Medical Sciences
14. National Medical College – Birgunj
15. Nepalgunj Medical College
16. Nepal Medical College
17. Nobel Medical College
18. Patan Academy of Health Sciences
19. Pokhara Academy of Health Sciences
20. TUTH Institute Of Medicine

21. Universal College of Medical Sciences

22. Devdaha Medical College

2.5.4 Workshop Activities

A. Sensitization to Hematology-Oncology as a Subspecialty (90 minutes)

- **Facilitator:** Dr. Ramila Shilpakar under the guidance of Dr. Bishesh Poudyal.
- **Content:** Presentation on career pathways in hematology-oncology, fellowship opportunities, and the critical need for specialists in Nepal given the cancer burden statistics
- **Method:** Interactive presentation with Q&A session
- **Outcomes:** Increased awareness of hematology-oncology as a career option with 15% of participants expressing interest in pursuing the subspecialty

B. Social Audit of Project Impact (120 minutes)

- **Facilitator:** Dr. Ramila Shilpakar
- **Content:** Review of baseline knowledge assessment versus post-intervention assessment, discussion of changes in clinical practices and patient outcomes
- **Method:** Small group discussions and plenary sharing
- **Outcomes:** Documented improvements in early diagnosis rates of hematological malignancies across participating institutions by an average of 22% compared to baseline data

C. Feedback Session for Virtual Classes (60 minutes)

- **Facilitator:** Dr Ramila Shilpakar/ Dr Bishesh Poudyal/ Dr Shama Pandey
- **Participants:** All
- **Method:** Anonymous digital survey and facilitated discussion
- **Outcomes:** 85% of participants rated the ECHO sessions as "highly valuable" for their clinical practice, with specific suggestions for sustainability

D. Mobile Application Overview and Hands-on Training (120 minutes)

- **Facilitator:** Technical team with Dr. Ramila Shilpakar
- **Content:** Introduction to the "IM Hemonc Essentials" mobile application features, installation support, and practice scenarios

- **Method:** Demonstration followed by hands-on practice with clinical case scenarios
- **Outcomes:** 100% of participants successfully installed the application with 92% demonstrating proficiency in using key features

2.5.5 Achievements and Impact

- Achieved **100% institutional participation** from all 22 targeted medical colleges.
- Average **47% improvement** in knowledge scores from pre-post assessments.
- **96% of participants** committed to standardizing hematological malignancy diagnosis in practice.
- Established a national peer network of Internal Medicine residents focused on hematology-oncology care.
- Launched the *IM Hemonc Essentials* app with full adoption among participants.

2.5.6 Challenges and Mitigation Strategies

Challenge	Mitigation Strategy
Limited exposure to hematology-oncology in some institutions	Paired inexperienced participants with mentors and peers for guided discussions
Technical issues during app installation on varied devices	On-site technical support and customized installation manuals provided
Disparities in baseline knowledge among participants	Organized tiered learning groups to align content with participants' levels

2.5.7 Follow-up and Sustainability Plans

1. **Quarterly virtual ECHO® sessions** to continue knowledge exchange.
2. **WhatsApp peer group** for real-time clinical case discussions.
3. **App updates** planned based on user feedback collected during the workshop.
4. **The Mentorship program** initiated to pair residents with hematology-oncology experts.
5. **Impact tracking** set for 6- and 12-month intervals post-workshop.

2.5.8 Conclusion

The March 1, 2025, workshop marked a significant milestone in the ASH Global Research Award 2022 project. It not only strengthened participants' clinical competencies in diagnosing hematological malignancies but also laid the foundation for a national learning community and sustainable educational tools. The workshop echoed the core project's message: "Redefining

outcomes through early diagnosis, informed decision-making, and collective action by future healthcare leaders in Nepal."

Project Activity 2.6 Research Dissemination and Publication

2.6.1 Activity Overview

The project aimed to generate and disseminate knowledge through academic publications, presentations, and policy briefs. These efforts sought to expand the impact beyond direct participants and influence broader medical education and practice in Nepal.

2.6.2 Abstract Submission

Survey findings were prepared for abstract submission and annual meeting presentation. The abstract focused on the status of hematology-oncology education in Nepal and the identified knowledge gaps among postgraduate trainees.

2.6.3 Academic Papers

Two academic research papers are in development:

1. **Paper 1: Hematology-Oncology Education in Postgraduate Internal Medicine Programs in Nepal: Current status and the Pressing Need for Improvement. Abstract accepted at American Society of Clinical Oncology Annual Meeting 2025, Chicago USA.**

Ramila Shilpakar, Bibek Acharya, et al. Hematology-oncology education in postgraduate internal medicine programs in Nepal: Current status and the pressing need for improvement. Journal of Clinical Oncology, volume 43, e21020-e21020(2025)

2. **Paper 2: Hematology Rotation in Internal Medicine Residency: Exploring the Residents' Perspective.**

Shama Pandey, Bishesh Sharma Poudyal, Ramila Shilpakar et al. Hematology Rotation in Internal Medicine Residency: Exploring the Residents' Perspective. [https://www.clinical-lymphoma-myeloma-leukemia.com/article/S2152-2650\(25\)02404-8/abstract](https://www.clinical-lymphoma-myeloma-leukemia.com/article/S2152-2650(25)02404-8/abstract)

CHAPTER 3: PROJECT OUTCOMES AND IMPACT

3.1 Achievement of Project Objectives

Objective	Achievement Status	Evidence
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Identify knowledge gaps among postgraduate health professionals	Fully Achieved	- 256 survey responses collected and analyzed - Comprehensive mapping of training gaps across 22 institutions
Implement educational intervention using Project ECHO®	Fully Achieved	- Over 20 sessions conducted 85% participant satisfaction - 78% reported improved clinical confidence
Develop mobile application for clinical decision support	Fully Achieved	- IM Hemonc Essentials app successfully developed and launched - 100% installation rate among workshop participants
Generate and publish academic research	Partially Achieved	- Two papers in development - Final publication pending
Public awareness through mobile app	Fully Achieved	- Public awareness component integrated into mobile app - User-friendly interface for non-medical users

3.2 Quantitative Impact Indicators

Indicator	Baseline (2022)	End of Project (2025)	% Change
PG trainees with confidence in hematological malignancy diagnosis	41%	78%	+37%
Medical colleges with standardized hematology rotation	40.9%	68%	+27.1%

Availability of diagnostic algorithms for clinical practice	22%	100%	+78%
Participants with access to hematology specialist guidance	40%	100%	+60%
Knowledge assessment scores	Average 61%	Average 89%	+28%

3.3 Qualitative Impact

The project demonstrated significant qualitative impact across several domains:

3.3.1 Educational Practice Transformation

- Established a nationwide learning community focused on hematological malignancies
- Introduced case-based learning as a standard approach for specialty education
- Normalized virtual learning for specialty training across geographical barriers

3.3.2 Clinical Practice Changes

- Increased awareness of diagnostic "red flags" for hematological malignancies
- Improved diagnostic workflow and appropriate test ordering
- Enhanced recognition of cases requiring specialist referral
- Better utilization of available resources for diagnosis

3.3.3 Institutional Commitment

- Formal recognition of hematology-oncology as a priority training area
- Increased institutional support for hematology rotations
- Enhanced inter-institutional collaboration for specialty education

3.3.4 Participant Testimonials

"Before this program, I would feel completely lost when encountering patients with suspected blood cancers. Now I have a systematic approach and know exactly which tests to order and when to refer."

- National Academy of Medical Sciences (NAMS)

"The mobile app has become my go-to resource during rounds. It's like having a hematologist in my pocket."

- 3rd Year Resident, BP Koirala Institute of Health Sciences

"The ECHO sessions bridged a critical gap in our curriculum. The case-based discussions were particularly valuable as they reflected the realities we face in Nepal."

- Faculty Member, Tribhuvan University Teaching Hospital (TUTH)

3.4 Unexpected Outcomes

Several positive unexpected outcomes emerged during the project:

- 1. **Inter-institutional Collaboration:** Enhanced cooperation between previously isolated medical institutions, creating informal networks for knowledge sharing.
- 2. **Career Interest Development:** A substantial number of participants (15%) expressed new interest in pursuing hematology-oncology as a subspecialty career.
- 3. **Specialist Engagement:** Practicing hematologists from across Nepal voluntarily contributed to ECHO sessions, expanding the expert pool beyond project team members.
- 4. **Public Awareness Extension:** While initially designed primarily for medical professionals, the mobile app's public awareness component gained significant attention, with requests for expansion to other cancer types.

CHAPTER 4: CHALLENGES, LESSONS LEARNED, AND SUSTAINABILITY

4.1 Challenges and Mitigation Strategies

Challenge	Mitigation Strategy	Outcome
Variable internet connectivity for virtual sessions	Recorded sessions made available for offline viewing; mobile app designed with offline functionality	Enhanced accessibility across all regions
Scheduling conflicts with clinical duties	Flexible participation options; multiple session timings	Improved attendance and participation

Limited exposure to hematology-oncology in some institutions	Participants Pairing	Created a balanced learning experience
Technical issues during app installation on varied devices	On-site technical support and customized installation manuals	100% successful app installation
Disparities in baseline knowledge	Tiered learning groups to align content with participants' levels	Appropriate progression for all knowledge levels
Reluctance in prescribing morphine during the pain study.	Developed evidence-informed educational content	Increased confidence in appropriate opioid prescribing
Limited access to morphine.	Networking among hospitals for supply coordination	Improved access to essential pain medications

4.2 Key Lessons Learned

4.2.1 Project Design and Implementation

1. **Baseline Assessment Value:** The comprehensive survey provided invaluable insights that shaped intervention design, highlighting the importance of thorough needs assessment.
2. **Hybrid Learning Approach:** Combining virtual ECHO sessions with an in-person culminating workshop maximizing both reach and engagement.
3. **Technology Adaptation:** Mobile applications need significant adaptation to local context and infrastructure realities to be effective in settings like Nepal.
4. **Institutional Buy-in:** Early engagement with institutional leadership was crucial for sustained participation.

4.2.2 Educational Methodology

1. **Case-Based Learning Effectiveness:** Real-world clinical cases from the Nepal context resonated more strongly than theoretical presentations.
2. **Peer Teaching Value:** Encouraging residents to present cases enhanced both engagement and learning retention.
3. **Practical Skills Focus:** Sessions emphasizing practical diagnostic approaches had higher participant satisfaction than theoretical discussions.
4. **Decision Support Tools:** Simple diagnostic algorithms proved more valuable than comprehensive but complex guidelines.

4.3 Sustainability Plan

The project was designed with sustainability as a core consideration, ensuring continued impact beyond the grant period:

4.3.1 Technical Sustainability

1. **Mobile Application Support:** A five-year Annual Maintenance Contract (AMC) has been established to ensure the "IM Hemonc Essentials" app remains functional, updated, and relevant.
2. **Content Update Mechanism:** A dedicated content advisory committee comprising hematologists, oncologists, and educational experts will review and update app content annually.
3. **Offline Functionality:** The app's offline capabilities ensure access even in remote areas with limited connectivity, which is critical for Nepal's geographical diversity.
4. **Open-Source Approach:** The educational content has been developed with an open-source framework that allows for adaptation and implementation in similar resource-limited settings.

4.3.2 Institutional Sustainability

1. **Curriculum Integration:** Eight participating medical colleges have formally incorporated the hematology-oncology educational modules into their Internal Medicine curricula.
2. **Faculty Development:** 14 faculty members received specialized training and will serve as institutional champions to sustain the educational initiative.
3. **Institutional Commitment:** Written commitments have been secured from 12 participating institutions to continue dedicated hematology rotations beyond the project period.
4. **Resource Library:** A digital repository of all educational materials, case studies, and diagnostic algorithms has been established and will be maintained by Cancer Care Nepal.

4.3.3 Financial Sustainability

1. **No-Cost Model:** The mobile application will remain free for all healthcare professionals, with maintenance costs covered by the AMC and institutional partnerships.
2. **Resource Mobilization:** Cancer Care Nepal has developed a sustainability strategy that includes approaching additional donors for continued support of the educational components.
3. **Cost-Efficient Design:** The virtual learning model reduces ongoing operational costs, making continuation feasible with minimal funding.

4. **Integration with Existing Systems:** The educational components have been designed to integrate with existing medical education frameworks, reducing the need for separate funding streams.

4.3.4 Knowledge Network Sustainability

1. **Community of Practice:** A self-sustaining network of resident physicians and faculty interested in hematology-oncology has been established across Nepal.
2. **Knowledge Transfer Mechanisms:** Train-the-trainer approaches were utilized to ensure knowledge continuity within institutions even as residents graduate.
3. **National Working Group:** A national working group for hematological malignancies education has been formed with representatives from multiple institutions to oversee continued activities.
4. **International Partnerships:** Ongoing relationships with ASH mentors and international experts will provide continued access to updated global practices and standards.

CHAPTER 5: FUTURE DIRECTIONS

5.1 Scaling and Expansion Opportunities

The success of this project has revealed several promising avenues for scaling and expanding its impact:

5.1.1 Geographical and Professional Expansion

1. **Regional Expansion:** The model can be replicated in neighboring South Asian countries facing similar challenges in hematology-oncology education.

2. **Professional Diversity:** Expanding the target audience to include nursing professionals, laboratory technicians, and allied health workers who play crucial roles in the cancer care continuum.
3. **Undergraduate Integration:** Adapting key components for undergraduate medical education to establish foundational knowledge earlier in the training pipeline.

5.1.2 Content and Technological Enhancement

1. **Disease Scope Expansion:** Extending the educational model and mobile application to cover solid tumors and other oncological emergencies.
2. **Advanced Diagnostic Support:** Incorporating machine learning algorithms to enhance the diagnostic capabilities of the mobile application.
3. **Telemedicine Integration:** Developing secure consultation capabilities within the app to connect frontline providers with hematology specialists for difficult cases.
4. **Language Localization:** Creating Nepali language versions of key educational components to reach healthcare workers with limited English proficiency.

5.2 Research Priorities

The project has identified several critical areas for future research:

1. **Impact Assessment:** Longitudinal studies to evaluate the impact of improved physician knowledge on patient diagnosis timelines and outcomes.
2. **Implementation Science:** Research on the most effective strategies for integrating specialized knowledge into routine clinical practice in resource-limited settings.
3. **Technology Adoption:** Studies on barriers and facilitators to mobile health application adoption among healthcare providers in Nepal.
4. **Cost-Effectiveness:** Comprehensive cost-effectiveness analyses of educational interventions in reducing cancer morbidity and mortality.
5. **Clinical Validation:** Validation studies for the diagnostic algorithms developed for mobile applications across diverse clinical settings.

5.3 Policy Recommendations

Based on project findings and experiences, the following policy recommendations have been formulated:

5.3.1 Medical Education Reform

1. **Standardized Curriculum:** To develop and implement a standardized hematology-oncology curriculum across all postgraduate Internal Medicine programs in Nepal.
2. **Rotation Requirements:** To establish adequate rotation periods in hematology for all Internal Medicine residents.
3. **Faculty Development:** To create specialized training pathways for faculty interested in hematology-oncology to increase the pool of qualified instructors.

5.3.2 Healthcare System Strengthening

1. **Diagnostic Network:** To develop a tiered diagnostic network for hematological malignancies with clear referral pathways.
2. **Telemedicine Support:** To establish telemedicine consultation services connecting district hospitals with specialized cancer centers.
3. **Essential Medications:** To improve access to essential medications for hematological malignancies, building on findings from the pain management study.

5.3.3 Digital Health Integration

1. **mHealth Standards:** To develop national standards for clinical decision support applications to ensure quality and safety.
2. **Digital Infrastructure:** To invest in digital infrastructure to support virtual learning and telehealth services for specialized care.
3. **Data Reporting:** To integrate digital tools for standardized reporting and tracking of hematological malignancies to improve epidemiological data.

5.4 Funding and Partnership Opportunities

Several potential funding and partnership opportunities have been identified to sustain and expand the project's impact:

1. **Multilateral Agencies:** WHO, UICC, and IAEA have programs supporting cancer control in low-resource settings that align with the project's objectives.
2. **Philanthropic Organizations:** Organizations like the Leukemia & Lymphoma Society and global cancer foundations could support expansion.
3. **Academic Partnerships:** Formal partnerships with international academic institutions for continued knowledge exchange and research collaboration.

4. **Government Integration:** Working with the Ministry of Health to incorporate the educational model into national physician training programs.

CHAPTER 6: CONCLUSION

The ASH Global Research Award project "Addressing knowledge gap among health professionals in postgraduate training program through educational intervention for early diagnosis and treatment of hematological malignancies" has successfully achieved its core objectives of identifying knowledge gaps, implementing targeted educational interventions, and developing context-specific clinical decision support tools for hematological malignancies in Nepal.

Through a comprehensive survey of 256 postgraduate medical trainees across 22 medical institutions, the project established a baseline understanding of the systemic deficiencies in hematology-oncology education. This piloted the formation of customized educational content, presented through over 24 Project ECHO® virtual sessions—23 classes and 1 introductory session—impacting more than 150 Internal Medicine residents and faculty nationwide.

The development and launch of the "IM Hemonc Essentials" mobile application represents a significant innovation in delivering specialized knowledge to frontline healthcare providers in resource-limited settings. By incorporating diagnostic algorithms, treatment protocols, and procedural guides adapted to the Nepal context, the app provides critical decision support for early detection of hematological malignancies.

Quantitative assessments demonstrate a 47% improvement in knowledge scores and a 37% increase in clinical confidence among participants. Qualitative feedback highlights the transformation in clinical approach, with participants reporting more systematic evaluation of suspected cases and appropriate referral decisions.

The project has successfully laid the foundation for sustained improvement in early diagnosis of hematological malignancies in Nepal. By equipping the next generation of physicians with enhanced knowledge, practical skills, and digital decision-support tools, the project has created a multiplier effect that will benefit thousands of patients with blood cancers in the years to come.

The collaborative model between Cancer Care Nepal, American Society of Hematology, and participating medical institutions demonstrates how targeted educational interventions can address critical gaps in specialized healthcare knowledge in resource-limited settings. The lessons learned and approaches developed through this project offer valuable insights into similar initiatives targeting other specialized fields across low- and middle-income countries.

APPENDIXES







