Ōtākou Whakaihu Waka
UNIVERSITY OF OTAGO
Pōneke Wellington Campus

Summer Studentships 2026/2027

PROJECT TITLE:
HARNESS-2: Characterising the perioperative immune response using routine clinical biomarkers and its relationship with postoperative recovery.

AIM:
The HARNESS study (HARNESSing the immune response to surgery for biomarker discovery and translation) aims to characterise the perioperative immune response as a functional biomarker for predicting adverse postoperative outcomes. The study has two complementary arms: a novel biomarker arm examining protein expression on immune cells by whole blood flow cytometry, and a clinical biomarker arm leveraging routine blood tests already collected as standard of care. The latter is the focus of this studentship. The aim of the studentship is to analyse the relationship between perioperative immune biomarkers derived from routine clinical tests – specifically complete blood count (CBC) indices (including immature granulocyte measurements) and C-reactive protein (CRP) – and postoperative outcomes in an expanded HARNESS cohort. Objectives of the summer studentship: (1) Continue prospective recruitment of patients undergoing major surgery at Wellington Hospital and expand recruitment at Wakefield Hospital as a second site. (2) Curate and expand the existing HARNESS dataset by extracting previously uncollected clinical variables (e.g., immature granulocyte counts from CBC results) from patient records. (3) Analyse the relationship between serial perioperative CBC indices and CRP with postoperative complications (graded by the Clavien-Dindo classification) and patient-reported recovery (QoR-40 scores at 1, 2, 3, 6, and 12 weeks post-surgery). (4) (4) Assess whether routine clinical biomarkers can serve as accessible, low-cost predictors of adverse postoperative outcomes in an Aotearoa context.

METHODS:
The HARNESS study is a prospective observational study recruiting patients undergoing major cardiac and non-cardiac surgery. The preceding summer studentship (2025/2026) generated an initial dataset of perioperative immune biomarkers, CBC indices, and CRP measurements from the first 25 patients from the HARNESS dataset. This studentship (2026/2027) builds directly on that foundation; the dataset is expected to reach n=50 prior to the student commencing and n=60 by the time the studentship concludes. <u>Continued recruitment.</u> The student will continue to prospectively recruit patients at Wellington Hospital over the summer period, following the established protocol (six peripheral blood samples per patient: pre-incision, 1 hr and 3-6 hrs post-incision, and once daily for the first three postoperative days). A key focus of this studentship will be expanding recruitment at Wakefield Hospital as a second site, increasing the cohort size and broadening the generalisability of findings.

Dataset curation and expansion. The student will expand the existing HARNESS database by extracting clinical variables not yet incorporated, most notably immature granulocyte measurements from archived CBC results. Immature granulocytes (band cells) are a clinically accessible marker of innate immune activation and may provide additional predictive value beyond standard differential counts. All data extraction will be performed from patient records using a standardised template.

Biomarker-outcome analysis. Serial CBC indices (including neutrophil-to-lymphocyte ratio, immature granulocyte counts, and other differential parameters) and CRP will be analysed in relation to two categories of postoperative outcome. Postoperative complications will be captured at 30 days and graded using the Clavien-Dindo classification, which stratifies complications by severity from minor (Grade I) through to death (Grade V), allowing both binary and ordinal analyses. Patient-reported recovery will be assessed using the QoR-40 questionnaire, administered at 1, 2, 3, 6, and 12 weeks after surgery, capturing five dimensions of recovery: emotional state, physical comfort, psychological support, physical independence, and pain. Where data are available, CBC indices and CRP will be compared against the novel flow cytometry biomarkers collected in the discovery arm of HARNESS, to determine whether the novel markers provide additive predictive information beyond what is already captured by routine clinical tests. Statistical methods will include correlation analyses, regression modelling, and group comparisons (e.g., ANOVA, Mann-Whitney U) as appropriate.

Compared to the preceding studentship, HARNESS-2 advances the project in four key ways: (1) extracting previously uncollected immature granulocyte data from archived CBC results; (2) expanding recruitment to Wakefield Hospital to broaden the cohort; (3) conducting the first analysis of QoR-40 patient-reported recovery trajectories against perioperative immune biomarkers; and (4) directly comparing routine clinical biomarkers with the novel flow cytometry measures from the HARNESS discovery arm to determine their additive predictive value.

RESEARCH SIGNIFICANCE:

Despite significant advances in perioperative care, surgery remains associated with substantial postoperative morbidity, and the risk of adverse recovery cannot be fully explained by conventional factors such as age, comorbidity, and surgical complexity alone. There is a compelling need for novel, accessible biomarkers that can identify at-risk patients early enough to modify their care. The immune response to surgery is a central and underexplored driver of postoperative pathology, but most immunological biomarker research has relied on specialised assays that are impractical for routine clinical use.

This project addresses that gap by focusing on CBC indices and CRP – tests already performed as standard of care in surgical patients – as potential immune biomarkers of postoperative risk. If perioperative changes in these routine measures predict Clavien-Dindo-graded complications or impaired QoR-40 recovery trajectories, this would have immediate and low-cost clinical applicability. Expanding recruitment to Wakefield Hospital strengthens the cohort and improves the generalisability of findings across different surgical contexts. Together, this work advances the HARNESS framework for immune biomarker discovery and moves it closer to clinical translation.

STUDENT'S ROLE AND EXPOSURE TO SCIENTIFIC METHOD:

With the support of their supervisors and the HARNESS research team, the student will contribute to patient recruitment at both Wellington and Wakefield Hospitals, expand the existing database by extracting additional clinical variables from patient records, and lead the primary biomarker-outcome analyses. The student will gain experience in prospective clinical research, structured data extraction and curation, and applied biostatistics. They will be trained in and apply statistical methods appropriate to the data (including correlation, regression, and group comparison analyses), and will be supported in interpreting findings in a clinical context. The student will have the opportunity to contribute to a manuscript and/or conference presentation arising from this work.

RELEVANT PREVIOUS EXPERIENCE FOR STUDENTS (Education or Research):
Previous experience in a laboratory or clinical research setting is favoured but not essential. An interest in immunology, perioperative medicine, or biostatistics would be an advantage. Familiarity with basic data handling (e.g., spreadsheets) is desirable. Given the analysis focus of this studentship, students with some exposure to or enthusiasm for statistics are particularly encouraged to apply.

Main supervisor:	Dr Kathryn Hally	
Email address:	Kathryn.hally@otago.ac.nz	
Other Supervisor/s:	Dr Lupe Taumoepeau, Vascular and Endovascular Surgeon, Te Whatu Ora – Capital, Coast and Hutt Valley	
Host Department:	Department of Surgery and Critical Care	
Location:	Department of Surgery and Critical Care, Wellington Hospital and Wakefield Hospitals	
	Can students work remotely?	No