Welcome to UNC Hematology/Oncology!
UNC and Chapel Hill

UNC
- Oldest public university in the US
- NCI-ranked “Exceptional” Comprehensive Cancer Center
- Gillings School of Public Health (#2 in U.S.)
- Eshelman School of Pharmacy (#1 in U.S.)
- UNC Top 10 in NIH Funding

Chapel Hill
- Classic university town
- Triangle (+ Durham and Raleigh)
- Great culture:
  - “Foodiest” small town (CH) and small city (Durham) in America
  - Wonderful arts scene
UNC Hematology / Oncology

- 55-60 faculty, 19-21 fellows
  - Oncologic subspecialties
  - Classical Hematology

- UNC Lineberger
  - 350 members from multiple schools, esp:
    - Schools of Medicine, Public Health, Pharmacy
    - Largest research entity at UNC

- McAllister Heart Institute
  - Thrombosis/hemostasis/vascular research
  - International leadership
UNC Hematology / Oncology  
*Create and Apply Knowledge*

**Research**

>300 publications per year  
(50% first or last author)

**Clinical care**

135,000 Patient visits  
5000 New patients / year  
+ 2,700 at Rex affiliate  
650 on treatment trials

<table>
<thead>
<tr>
<th>Year</th>
<th>NIH Direct Cost funding to Division members</th>
</tr>
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<tbody>
<tr>
<td>2002</td>
<td>$0</td>
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<td>2004</td>
<td>$5,000,000</td>
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<tr>
<td>2012</td>
<td>$25,000,000</td>
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<td>2013</td>
<td>$30,000,000</td>
</tr>
<tr>
<td>2014</td>
<td>$35,000,000</td>
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</tbody>
</table>
Questions?
Missions of the UNC Hematology/Oncology Fellowship Program

• To provide outstanding clinical training
• To provide outstanding research opportunities
  • Basic Science
  • Translational
  • Clinical
  • Health Services
• For fellows to have successful careers in hematology/oncology
Fellowship Program Structure

Fellowship education committee*

Fellowship Director
Alice Ma

UNC graduate medical education

Associate Program Director:
Billy Kim

Associate Program Director:
Frances Collichio

*Consists of 2 members from each class, program directors, Lisa Carey, Tom Shea, Nigel Key, Bill Wood, Autumn McRee, Chad Pecot, Matt Milowsky, Brandi Reeves, Marcie Riches and Matt Foster
# American Board of Internal Medicine Requirements

<table>
<thead>
<tr>
<th>Board</th>
<th>Months in Training</th>
<th>Clinical Months</th>
<th>Continuity clinic $^A$</th>
<th>Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oncology</td>
<td>24</td>
<td>12$^B$</td>
<td>24 months</td>
<td>BM Bx Chemotherapy CVC</td>
</tr>
<tr>
<td>Hematology</td>
<td>24</td>
<td>12</td>
<td>24 months</td>
<td>BM Bx Chemotherapy CVC</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Peripheral blood smear, apheresis</td>
</tr>
<tr>
<td>Both</td>
<td>36</td>
<td>18 $^C$</td>
<td>36 months</td>
<td></td>
</tr>
</tbody>
</table>

$^A$: ½ day per week

$^B$: 50% of the time outpatient months

$^C$: 12 months neoplastic dz and 6 months non-neoplastic heme
ABIM Alternate Pathways

- Geriatrics and Medical Oncology
- Pediatric Hematology/Oncology and Adult Hematology or Oncology
- Infectious Diseases and Medical Oncology
- ABIM research pathway
First year

Clinical and inpatient focus

<table>
<thead>
<tr>
<th>Inpatient</th>
<th>Consult</th>
<th>Clinic</th>
<th>Elective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malignant Heme</td>
<td>Coag</td>
<td>Benign Heme</td>
<td>Elective/S elective</td>
</tr>
<tr>
<td>1-2</td>
<td>Total 2-3</td>
<td>1-2</td>
<td>3</td>
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<tr>
<td>BMT</td>
<td>Solid Tumors</td>
<td>1-2</td>
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<tr>
<td></td>
<td></td>
<td>Benign Tumor</td>
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<td></td>
<td></td>
<td>1-2</td>
<td></td>
</tr>
</tbody>
</table>

Electives: solid tumor clinics, transfusion medicine, hematopathology, inpatient solid tumor oncology, outpatient BMT, palliative care (required 2 weeks) etc

Vacation: 4 weeks
Fellowship tracks

Fellows select career pathway in late first, early second year

- Basic Science Research track
- Clinical and translational research track
- Health outcomes research track
- Clinical track
## Outpatient

<table>
<thead>
<tr>
<th>Year</th>
<th>Continuity clinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>6-month rotating blocks (GI, breast)</td>
</tr>
<tr>
<td>2nd year</td>
<td>Four 6 month rotating blocks (malignant heme, benign heme, lung and GU)</td>
</tr>
<tr>
<td>3rd year research track</td>
<td>0.5 day in clinic of interest</td>
</tr>
<tr>
<td>2nd or 3rd year clinical track B</td>
<td>5 month blocks of outpatient clinics per year</td>
</tr>
</tbody>
</table>

A: Rotations defined as: thoracic, breast, GU, GI, melanoma, head and neck
B: Clinical track fellows will have 0.5 day in one clinic of interest (e.g. GI) and then rotate through the areas (breast, thoracic, etc) for more prolonged exposure
Research Training

• NC TraCS (North Carolina Translational and Clinical Sciences Institute)
  – MSCR (Masters of Science in Clinical Research)
    • 2 year degree program training individuals to be principal investigators and collaborators in clinical/translational research
  – TCRC (Translational and Clinical Research Curriculum)
    • 2 year non-degree program providing training in biostatistics, epidemiology and career development skills.
    • https://tracs.unc.edu/index.php/services/education/translational-and-clinical-research-curriculum

• K12 programs
  – For senior trainees and junior faculty in basic or translational research in hematology or oncology
Research Support

• Early Grants
  – Hematology T32 (coagulation, sickle cell)
  – New Immunotherapy T32
  – New Geriatric Oncology T32
  – Other Institutional T32 awards (Pharmacology, Nursing)
  – Health Behavior/Health Outcomes
  – T32-like Institutional Funding for well-qualified research track fellow

• Later Grants
  – K12 for senior fellows/junior faculty
  – KL2
  – BIRCWH

• Other
  – Foundational Grants (ASCO, ASH, etc)
  – NIH Loan Repayment
# Planning the Path to Research Independence....

<table>
<thead>
<tr>
<th>Fellowship Faculty</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
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<table>
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</table>

<table>
<thead>
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<th>K08 or K23 or R21</th>
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<th>4</th>
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<th>RO1 or other (Individual)</th>
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Fellow’s career choices

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<th>Time Period</th>
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<th>Private</th>
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<th>Gov</th>
<th>Unknown</th>
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<td>1995-2009</td>
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<td>2010-2018</td>
<td>30</td>
<td>22</td>
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</table>
“BENIGN” OR “CLASSICAL” HEMATOLOGY AT UNC
The Hemostasis and Thrombosis Program

- Comprehensive Hemophilia Treatment Center (est. 1977)
- 6 physicians, 3 clinical nurses, 1 research nurse, 3 research coordinators, 1 social worker, 1 pharmacist
- Currently follows ≈250 adults, ≈100 children with hemophilia, several hundred vWD
- ≈25 new thrombosis patients/week
- Multi-disciplinary HHT Clinic
Hematology ‘Firsts’ at UNC

- 1947: Hemophilia dog colony founded by Kenneth Brinkhous MD
- 1952: Invention of the APTT
- 1956: Discovery of factor X (‘Stuart Prower factor’)
- 1962: Development of the first FVIII concentrate
- 1972: Separation of plasma FVIII from VWF
- 1978: Center for Thrombosis and Hemostasis founded by Harold Roberts, MD
- 1987: First human trial of recombinant clotting factor (rFVIII)
- 1989: First administration of rFVIIa in the US
- 1991: Isolation of vitamin K carboxylase
- 1994: Elucidation of the mechanism of action of rFVIIa
- 1997: First mouse model of hemophilia B
- 2004: Identification of the gene for Vitamin K epoxide reductase
Hematology T32 Training Grant

• Continuously funded since 1975
• An estimated 95 previous T32 scholars, (including 1 Nobel Laureate!)
• Clinical or bench research in benign hematology – 5 slots
Previous Benign Hematology Trainees

- **2016**
  - Joan Beckman—U Minnesota, Asst Professor
  - Damon Houghton—Mayo Clinic, Asst Professor
- **2015**
  - Karlyn Martin—Northwestern—Asst Professor
- **2014**
  - Ming Lim—University of Utah—Asst Professor
- **2013**
  - Brandi Reeves -- UNC
- **2011**
  - Marshall Mazepa—U Wisconsin
  - Payal Desai – Ohio State
  - Micah Mooberry -- UNC
Clinical / Translational Research at UNC: Opportunities for Fellows
Guiding principles:
- **Complete** a portfolio of work within fellowship timeframe
- Develop relationship with $\geq 1$ mentor
- Create an individual, coherent body of work
- Have fun 😊....

Clinical and Translational Research Program

- Tissue-based genomic/transcriptomic/proteomic profiling
- Animal models

- Investigator-initiated treatment and nontreatment trials
- Global Heme/Oncology
UNC Infrastructure

• Highly integrated, well-funded institution

• Opportunities
  – > 30 Division faculty with track record
  – 6 PhD members with collaborative roles
  – > 400 UNC faculty working in Heme/Onc

• Longstanding emphasis and focus on team science
  – Multiple joint appointments with Schools of Public Health and Pharmacy
  – Training grant opportunities across this landscape
  – Divisional commitment to supporting research years
General Approach for Heme/Onc Fellows

- Experienced
  - Mentor relationship built at the outset
  - Resources, trajectory, oversight planning before arrival
  - Work can start as early as 1st year

- Inexperienced but bright and enthusiastic
  - Exposure to breadth of research early 1st year
  - Designated faculty guidance
  - Find mentor, start working within that umbrella 2nd yr+

- Training: Alphabet soup programs - MSCR, MPH, TraCS…
BREAST CANCER

Hy Muss
Geriatric Oncology

Lisa Carey
Biomarkers, clinical trials

Claire Dees
Drug Development Phase I

Katie Reeder-Hayes
Health Services & Outcomes

Carey Anders
Brain metastases, Clinical trials

Trevor Jolly
Geriatric Oncology
Preparation Meets Opportunity

New cGMP facility for cellular Rx
- CAR T trials
- $3m correlative immunooncology

Mouse Phase I Unit
- 32 funded grant proposals: $25M
- Success: Cell, Nature, Cancer Cell, Cancer Disc
- 5,000 cages
- Small animal imaging (PET/CT, MRI, U/S)
- PK/PD monitoring

Multiple Labs
- CPO, LCCC, Marsico, Genetics, MBRB

100% funding for PhD faculty

305 total publications in FY16
- 8 only authored
- 61 first authored
- 75 last authored
Finding Your Research Niche

Clinical trials

1st year – conferences, seminars, discussions with faculty

Translational research

1st-2nd year – Ongoing talks with Drs. Ma and Kim
Facilitated discussions with relevant faculty
Recommendations for specific training program

Health Services research

3rd (4th) year - MAGIC

Learning the ropes
Getting attached and funded
Summary

• **UNC** provides a rich resource for “clinical” research
  – Large Division, most do funded research
  – Clinical / Translational / Health services research
  – Myriad training grants and support

• **Goals for fellows training in clinical research:**
  – Develop a portfolio
  – Differentiate yourself
  – Develop the skills to run your own program
Research Orientation to the Lineberger Comprehensive Cancer Center

WILLIAM Y. KIM, MD
RUSH S. DICKSON ASSOCIATE PROFESSOR OF MEDICINE AND GENETICS
ASSOCIATE DIRECTOR FOR RESEARCH, HEMATOLOGY/ONCOLOGY FELLOWSHIP

JONATHAN S. SERODY, MD
ELIZABETH THOMAS PROFESSOR OF MEDICINE, MICROBIOLOGY AND IMMUNOLOGY
ASSOCIATE DIRECTOR TRANSLATIONAL SCIENCE LINEBERGER CANCER CENTER
ASSOCIATE CHIEF DIVISION OF HEMATOLOGY AND ONCOLOGY
UNC Lineberger:

NC’S PUBLIC COMPREHENSIVE CANCER CENTER.

MATRIX CANCER CENTER EMBEDDED IN UNC-CH.

AREAS OF FOCUS

Population Sciences Research
Dissemination and outreach in NC
Economic Development
Clinical Excellence
Basic Research
Clinical and Translational Research
Facilities

Lineberger Bldg: 79,000 nsf

Marsico Hall: 22,000 nsf
(Opened 2014)

NC Cancer Hospital
Clinical space increased 3-fold
Research space: clinical trials unit, Protocol office, PK/PD Lab
53 Inpatient Beds
BMT Unit in Neuropsychiatry Hospital with additional 24 beds
NCI Funding Over The Past 8 Years

2016 NCI FUNDING:
- Michigan: $60.2M
- Stanford: $56.1M
- UNC: $54.4M
- Wash U: $42.3M
- Duke: $39.1M
- Emory: $24.4M

(9th among matrix cancer centers)

http://report.nih.gov/award/index
University Cancer Research Fund

Funded $395M for cancer research through 2008-2015 (with $46.4M in FY2016).

Institutional impact:

- Recruitment/Retention >180 faculty
- Major investment – genomics, NGS and bioinformatics, cellular immunotherapy program
- Built population and hospital cohorts
- Created informatics and big data infrastructure
- Developed therapeutics, devices and diagnostics
- Statewide outreach and network support

In 2014, the UCRF funding created 2,250 NC jobs and generated $333M in economic impact.
Cancer Genomics: National Leadership

The Cancer Genome Atlas
Understanding genomics to improve cancer care

28 tumor types
10,000 samples
>100 trillion bases

--Hoadley, Cell, 2014

The New York Times
SEPTEMBER 23, 2012

More Breast Cancer Treatments Hinted in Study

LCCC 1108 –UNCseq
Over 2,900 patients consented

CHUCK PEROU, KATIE HOADLEY

60 Minutes piece on IBM Watson

https://www.youtube.com/watch?v=Y9HumO20GKc

Cancer Genomics: National Leadership

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Discovering Cancer Drugs

CENTER FOR INTEGRATIVE CHEMICAL BIOLOGY AND DRUG DISCOVERY (CICBDD)

Many Cancer Projects:
• Mer Inhibitors for Pediatric Leukemia
• IDH1 Inhibitors for Glioma, Leukemia
• >$14M in funded proposals

Science Focus:
• Chemical Biology of Chromatin Regulation
• 55+ publications: Nature Chemical Biology, PNAS, Cell, Science
• 2 Oncology start-ups with LCCC founders

Ongoing Expansion:
• New recruitment: Jeff Aubé (U of K), Tim Willson (GSK)
• Leveraging $100M gift to Eshelman School of Pharmacy
Studying Cancer in the Mouse

MOUSE PHASE I UNIT

- 50+ partners in academia and industry
- 40+ publications (e.g. Cell, Nature, Cancer Cell, Cancer Disco.)
- 32 funded grant proposals: $25M
- 5,000 cages for serial housing
- Small animal imaging (PET/CT, Optical, MRI, U/S)
- Pharmacokinetics and Pharmacodynamic Monitoring

COLLABORATIVE CROSS

- 80+ publications since 2011
- Example:
  - Pardo-Manuel de Villena et al., Nature Genetics, 2015
  - Sharpless et al., Cell 2013
Kinoming

In progress trials in melanoma, lung, lymphoma and breast cancer

**FUNDING:** NCI R01, Komen, MRA, LLS, V Foundation, Lustgarten
Cellular Immunotherapy Program

Developed the sixth CAR-T cell program in the United States
cGMP facility built and functioning off HWY 54 on Quadrangle Boulevard
Two CAR-T cell trials currently open at UNC

CD30-CAR therapy after autologous SCT for patients with relapsed/refractory Hodgkin and anaplastic large cell lymphoma

CD30-CAR therapy for R/R patients not undergoing autograft

Plans for CAR therapy with suicide gene for ALL and CAR therapy for myeloma in 2018

Heparanase promotes tumor infiltration and antitumor activity of CAR-redirecd T lymphocytes
Ignazio Castana et al., Barbara Zaroldi et al., Valentina Hoppe et al., Gervit Wobser et al., Hao Liu et al., Eugene S. Kire et al.,
Michael M. Ittman et al., Dario Manchetti & Gianpierotto Dotti et al.

Developing novel murine CAR approaches to understanding efficacy in solid tumors

Identification of neoantigens from SNV, translocations and spliced variants

Biomarker discovery of response to checkpoint inhibitors

Support NCI RO1 x 3, NHLBI RO1, LLS, NCI SPORE, NCI T32, UCRF & Industry
LCCC Entrepreneurship
Division of Hematology/Oncology Members

There are six divisional members who have space and or resource commitment for laboratory work in the Lineberger Cancer Center.

- Also a much larger number of PhD investigators in the Cancer Center who have trained MD/MD PhD fellows.

There are four divisional investigators with laboratory-based research in the Carolina Cardiovascular Biology Center.
Jonathan Serody, MD

- Evaluations of the role of innate lymphoid cells in treating GI tract GVHD
- Interactions of immune and stromal cells and their roles in tumor growth
- Biomarker Response to Checkpoint Inhibitor Therapy
William Kim, MD

- **CLINICAL/TRANSLATIONAL RESEARCH**
- Cancer genomics (TCGA)
- Discovery of luminal and basal molecular subtypes of bladder cancer
- Genetic models of cancer using mice
- Immunotherapy/immunogenomics

---

**Intrinsic subtypes of high-grade bladder cancer reflect the hallmarks of breast cancer biology**

Jeffrey S. Damrauer\(^a,b\), Katherine A. Hoadley\(^a,c\), David D. Chism\(^a\), Cheng Fan\(^a\), Christopher J. Tiganelli\(^a\), Sara E. Wobker\(^a\), Jen Jen Yeh\(^a,c\), Matthew I. Milowsky\(^a\), Gopa Iyer\(^a\), Joel S. Parker\(^a\), and William Y. Kim\(^a,b,c\)

\(^a\)Department of Genetics, \(^b\)Department of Medicine, Division of Hematology/Oncology, \(^c\)Department of Surgery, \(^d\)Department of Pathology and Laboratory Medicine, and \(^e\)Department of Pharmacology, Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599; and \(^f\)Department of Medicine, Memorial Sloan-Kettering Cancer Center, New York, NY 10065

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**The next steps in next-gen sequencing of cancer genomes**

D. Neil Hayes\(^1\) and William Y. Kim\(^1,2,3,4\)

Lineberger Comprehensive Cancer Center, Department of Medicine, Department of Genetics, and Department of Urology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA.

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**MYC activation cooperates with Vhl and Ink4a/Arf loss to induce clear cell renal cell carcinoma**

Sean T. Bailey\(^{1,2}\), Aleisha M. Smith\(^{1,2}\), Jordan Kardos\(^{1,2}\), Sara E. Wobker\(^{1,3}\), Harper L. Wilson\(^{1}\), Bhavani Krishnan\(^{1}\), Ryoichi Saito\(^{1}\), Hyo Jin Lee\(^{1}\), Jing Zhang\(^{1,3}\), Samuel C. Eaton\(^{1}\), Lindsay A. Williams\(^{1,6}\), Ujjwala Manocha\(^{1}\), Dorien J. Peters\(^{1}\), Xinchao Pan\(^{1}\), Thomas J. Carroll\(^{1}\), Dean W. Flesher\(^{9}\), Vonn Walter\(^{10}\), Qing Zhang\(^{1,3}\), Joel S. Parker\(^{1,2}\), Jen Jen Yeh\(^{1,5}\), Richard A. Moffitt\(^{1,5}\), Janet Y. Leung\(^{1,11}\) & William Y. Kim\(^{1,2,11}\)
Chad Pecot, MD

Lung tumor models of metastasis and angiogenesis

Regulation of anti-tumor activity mediated by microRNA
Ben Vincent MD

Immunogenomic evaluations in cancer and infectious complications of cancer

Neoantigen vaccination for cancer treatment

Novel approaches to interrogate immune activity from sequencing data
Nigel Mackman, PhD

- Laboratory focuses on the role of tissue factor, coagulation proteases and protease activated receptors in hemostasis, thrombosis and inflammation.
- They have generated a variety of novel mouse lines and study mechanisms of thrombosis in cancer, the role of the clotting cascade in viral infections and in cardiac injury.

Hematology Fellow
CDAs in basic or translational research obtained by fellows

<table>
<thead>
<tr>
<th>Individual</th>
<th>CDA</th>
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<tbody>
<tr>
<td>Eben Lichtman</td>
<td>ASCO YIA</td>
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<tr>
<td>Ben Vincent</td>
<td>Komen, K12</td>
</tr>
<tr>
<td>Tracy Rose</td>
<td>BCAN YIA, K12</td>
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<tr>
<td>Jay Coghill</td>
<td>K08</td>
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<tr>
<td>Joan Beckman</td>
<td>Hemostasis and Thrombosis Research Society Mentored Research Award, K12</td>
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<tr>
<td>Hank van Deventer</td>
<td>K08</td>
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<td>David Chism</td>
<td>LCCC Developmental Research Award</td>
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<td>Autumn McRee</td>
<td>K12, LCCC Developmental Research Award</td>
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Note: this represents only basic and translational CDAs
### Faculty Who Have Mentored MD Fellows in the Basic Sciences in the Cancer Center

<table>
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<th>Mentor</th>
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<td>Ned Sharpless</td>
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<td>**Ben Vincent, **Jay Coghill/**Hank van Deventer/Judy Ng-Cashin</td>
<td>Jon Serody</td>
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<td>**David Chism, **Autumn McRee, **Tracy Rose, Mingqing Li,</td>
<td>Billy Kim</td>
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<tr>
<td>Jeremiah Boles</td>
<td>Nigel Mackman</td>
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<tr>
<td>**Brandi Reeves</td>
<td>Rafal Pawlinski</td>
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<tr>
<td>Eben Lichtman*, Raghuveer Ranganathan*</td>
<td>Gianpietro Dotti</td>
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<tr>
<td>Yvonne Chao*</td>
<td>Chad Pecot</td>
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<tr>
<td>Mark Woodcock*</td>
<td>Benjamin Vincent</td>
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*Current fellows
**Academic Faculty Members
LCCC Core Facilities

Animal models, Animal experiments and protocols, and Histopathology

Genomics and Bioinformatics
• Human and mouse microarrays, expression data from RNA from any source, custom arrays
• Massive parallel sequencing (4 platforms on campus; Illumina, 454, PacBio and Ion Torrent)

Immunogenomics Facility
• Neoantigen identification, adaptive immune receptor repertoire evaluation, mRNA-sequencing, flow cytometry and IHC from tumor samples

Flow Cytometry
Proteomics/Mass Spec
Tissue Procurement
Why MD Fellows:

- Fellows are better at making the work clinically relevant.
- Fellows are easier to fund.
- Fellows are good at bureaucracy needed for human studies.
- LCCC scientists will be enthusiastic about working with you!
Questions?

William Kim
wykim@med.unc.edu

Jon Serody
jonathan_serody@med.unc.edu
Opportunities for Training in Population Research

UNC Hematology/Oncology Training Program

Bill Wood, MD, MPH
Hanna Sanoff, MD MPH
Ethan Basch, MD MSc
Katherine Reeder-Hayes, MD MBA MSc
WHY UNC?

Training
Access to resources
Access to mentorship
WHO CAN TRAIN AS A POPULATION SCIENTIST?

• Fellows with prior research training or experience (MPH, biostats or epidemiology)
• Fellows with strong interest in population health and desire for academic career development
• Fellows who would like to know more and are willing to extend/work hard during fellowship
Elements of Population Science Training During Fellowship

- Advanced Methods Training
- Post-doctoral research fellowships
- Didactic/degree opportunities
- Gaining Research Experience
- Mentoring from division members
- Partnerships with the School of Public Health
UNC Cancer Research Training Programs

- Cancer Control Education Program
- NRSA Training Program in Health Services Research
- Cancer Care Quality Training Program
Overview: CCQTP

Home: Department of Health Policy
Leader: Stephanie Wheeler, PhD, Associate Professor of Health Policy
Aim: Train clinician and non-clinician scientists to work in multidisciplinary research teams to improve the cancer care quality across the cancer care continuum
Participants: pre/post doc, MD + PhD
Elements: coursework (some specified), journal club, seminars, network in SPH
Overview: NRSA

Home: Sheps Center for Health Svcs Research
Leader: Tim Carey, MD+ Morris Weinberger, PhD
Aim: Trainees will gain experience in applying research methods to the systematic analysis and evaluation of health care services and health policy issues (focuses include disparities, comparative effectiveness, dissemination/implementation, not limited to cancer research)
Participants: pre/post doc, MD + PhD
Elements: coursework ($$ support, degree oriented, not specific classes), weekly seminar, network across campus
Overview: CCEP

Home: Lineberger Comp Cancer Center
Leader: Jo Anne L. Earp, Sc.D
Aim: trains pre- and postdoctoral fellows for careers as independent investigators in interdisciplinary and collaborative cancer prevention and control research.
Participants: pre/post doc, MD + PhD
Elements: diverse faculty mentoring, core courses and individualized training program
Didactic/Degree Programs

Master of Public Health (School of Public Health)
Master of Science in Clinical Research (Dept of Epidemiology)
NCTraCS Translational and Clinical Research Curriculum certificate program
https://tracs.unc.edu/index.php/services/education/translational-and-clinical-research-curriculum
Odum Institute for Research in Social Science short courses
What Can I do as a Population Science-Focused Fellow at UNC?
Personalized home-based interval exercise training may improve cardiorespiratory fitness in cancer patients preparing to undergo hematopoietic cell transplantation

**Bone Marrow Transplant. 2016 Jul;51(7):967-72**

![Fig 2. Overview of exercise intervention.](image-url)
Neoadjuvant chemotherapy administration and time to cystectomy for muscle-invasive bladder cancer: An evaluation of transitions between academic and community settings.

_Urol Oncol. 2015 Sep;33(9):386.e1-6_

**Fig 1.**
Overall survival in patients who received NAC in AMC and in the community

**Highlights**
- We analyze bladder cancer patients referred to an academic center for cystectomy
- We compare neoadjuvant chemotherapy in the community and in an academic center
- Receipt of chemotherapy in the community was associated with a delay in cystectomy
- Those treated in the community get the same chemotherapy and have similar outcomes

Tracy Rose, MD
Ethan Basch, MD
Purpose: With improved cancer survival rates and the current trend of delaying parenthood, fertility is a growing issue among cancer patients. The purpose of this study was to evaluate the incidence of fertility counseling and sperm banking in reproductive-age male cancer patients and to assess factors that influence counseling and banking.

Statewide geographic variation in outcomes for adults with acute myeloid leukemia in North Carolina.


Hazard ratios (HRs) with 95% confidence intervals are illustrated from a survival analyses according to Area Health Education Centers region for adults with acute myeloid leukemia in North Carolina who received inpatient chemotherapy from 2003 to 2009 (n = 553). Cities with populations > 100,000 are noted.
This study found significant disparities in the receipt of SLNB, an innovative and morbidity-sparing procedure for early-stage breast cancer, among vulnerable populations including African-American women, those of low socioeconomic status, and the elderly. These disparities appear to persist over time, with only slight attenuation after controlling for geographic and institutional factors.
Race, response to chemotherapy, and outcome within clinical breast cancer subtypes.


Fig 1.

a Time to recurrence, b overall survival
Effect of Adjuvant Chemotherapy on Survival of Patients With Stage III Colon Cancer Diagnosed After Age 75 Years

Hanna K. Sanoff, William R. Carpenter, Til Sturmer, Richard M. Goldberg, Christopher F. Martin, Jason P. Fine, Nadine Jackson McLearny, Jeffrey A. Meyerhardt, Joyce Niland, Katherine L. Kahn, Maria J. Schymura, and Deborah Schrag

Hanna Sanoff, MD

ABSTRACT

Purpose
Few patients 75 years of age and older participate in clinical trials, thus whether adjuvant chemotherapy for stage III colon cancer (CC) benefits this group is unknown.

Methods
A total of 5,489 patients ≥ 75 years of age with resected stage III CC, diagnosed between 2004 and 2007, were selected from four data sets containing demographic, stage, treatment, and survival information. These data sets included SEER-Medicare, a linkage between the New York State Cancer Registry (NYSCCR) and its Medicare programs, and prospective cohort studies Cancer Care Outcomes Research and Surveillance Consortium (CanCORS) and the National Comprehensive Cancer Network. Data sets were analyzed in parallel using covariate adjusted and propensity score (PS) matched proportional hazards models to evaluate the effect of treatment on survival. PS trimming was used to mitigate the effects of selection bias.

Results
Use of adjuvant therapy declined with age and comorbidity. Chemotherapy receipt was associated with a survival benefit of comparable magnitude to clinical trials results (SEER-Medicare PS-matched mortality, hazard ratio [HR], 0.68; 95% CI, 0.53 to 0.88). The incremental benefit of oxaliplatin over non-oxaliplatin-containing regimens was also of similar magnitude to clinical trial results (SEER-Medicare, HR, 0.86; 95% CI, 0.77 to 0.94; NYSCCR-Medicare, HR, 0.62; 95% CI, 0.51 to 0.75) in two of the three examined data sources. However, statistical significance was inconsistent. The beneficial effect of chemotherapy and oxaliplatin did not seem solely attributable to confounding.

Conclusions
The non-investigational experience suggests patients with stage III CC ≥ 75 years of age may anticipate a survival benefit from adjuvant chemotherapy. Oxaliplatin offers no more than a small incremental benefit. Use of adjuvant chemotherapy after the age of 75 years merits consideration in discussions that weigh individual risks and preferences.

Fig 2. Percentage of elderly patients with stage III colon cancer treated with chemotherapy.
If positive, findings from this pilot study would suggest the potential for improving the care of older persons with CRC undergoing adjuvant chemotherapy through a home-based physical activity intervention to manage fatigue, HRQOL, and physical function.


Fig. 1. Study design.

*Includes all study assessments with the exception of muscle mass measurements which are performed as part of routine care.
†Includes only patient reported outcome (PRO) measures (with exception of MOS physical health and IADL measures) and Short Physical Performance Battery (SPPB)
African-Americans have a higher rate of proximal deep vein thrombosis at presentation.

*Thromb Res. 2010 Sep;126(3):e246-7*
Domains of Population Research: Heme Onc Faculty

Patient Reported Outcomes
Quality of Care
Comparative Effectiveness
Cost
Race and Age Disparities
Provider and System-Level Factors

Qualitative and Survey Methods
Dissemination/Implementation
Behavioral Interventions
Physical Activity Interventions
Supportive Care Interventions
Lineberger Resources: Cancer Outcomes Research Program

Weekly breakfast meeting
Listserv/social media networking
Monthly Grand Rounds
Lineberger Resources: CIPHER
Carolina Information and Population Health Resource

_a data resource:_ NC Central Cancer Registry linked to multiple payer claims (commercial, Medicare, Medicaid)—80% of NC cancer cases

_a facility:_ office and meeting space

_a team:_ Big Data analysts/programmers, secure data storage, IT infrastructure and support, multi-disciplinary investigators
UNC Project - Malawi
Current Heme-Onc Activities
Malawi country profile

- Population ~15.3 million (NC ~9.7)
- Surface area ~45,700 square miles (NC ~48,600)
- Life expectancy 56 years (US 78 years)
- Annual GDP per capita 318 USD (US 47,199)
- Human Development Index rank 171 out of 187 countries (US 4)
- HIV prevalence 11% in 2009
- Severely limited cancer facilities
  - No RT
  - 4 pathologists
  - 2 clinical oncologists
  - 2 hematologists
  - 1 medical oncologist
UNC Project-Malawi

• >20-year collaboration between UNC and Malawi Ministry of Health, established in 1991
• Based in the capital Lilongwe at Kamuzu Central Hospital (KCH)
• 1000-bed public tertiary care hospital
• 1 of 2 national teaching hospitals serving a catchment area of 4-5 million people
• >350 employees, 40,000 square-feet, extensive community engagement
• Longstanding involvement of UNC IGHID, Lineberger, Surgery, Women’s Health, Gillings School of Global Public Health
• Training site for Fogarty AIDS International Training and Research Program
• Clinical trial site for protocols implemented through numerous multinational NIH-sponsored networks (ACTG, HPTN, IMPAACT, CHAVI, AMC)
Malawi National Cancer Registry (n = 18,946; 2007-2010)

Men

Women

Msyamboza et al, BMC Res Notes 2012
KCH Pathology Laboratory

- UNC Project-Malawi and KCH collaboration
- 200,000 USD renovations and installation of new equipment
- Aperio virtual microscopy system installed for long-distance virtual consultation
- Operational since July 2011
- Specimen review provided by Prof. George Liomba
- Immunohistochemical staining implemented
- >10,000 specimens reviewed to date

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<tr>
<th></th>
<th>PREMALIGNANT</th>
<th>HIV prevalence*</th>
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<tr>
<td></td>
<td>N=178</td>
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</tr>
<tr>
<td>Cervix</td>
<td>156 (87.6%)</td>
<td>21/31 (67.7%)</td>
</tr>
<tr>
<td>Eye</td>
<td>13 (7.3%)</td>
<td></td>
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<tr>
<td>Other</td>
<td>9 (5.1%)</td>
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<tr>
<td><strong>MALIGNANT</strong></td>
<td>N=861</td>
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<tr>
<td>Cervix</td>
<td>117 (13.6%)</td>
<td>13/16 (81.2%)</td>
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<tr>
<td>Lymphoma</td>
<td>91 (10.6%)</td>
<td>4/13 (30.8%)</td>
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<tr>
<td>Esophagus</td>
<td>86 (10.0%)</td>
<td>2/8 (25.0%)</td>
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<tr>
<td>Sarcoma (non-Kaposi)</td>
<td>75 (8.7%)</td>
<td>2/9 (22.2%)</td>
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<tr>
<td>Breast</td>
<td>61 (7.1%)</td>
<td>1/11 (9.1%)</td>
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<tr>
<td>Head and neck</td>
<td>52 (6.0%)</td>
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<tr>
<td>Bladder</td>
<td>36 (4.2%)</td>
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<tr>
<td>Eye</td>
<td>36 (4.2%)</td>
<td></td>
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<tr>
<td>Prostate</td>
<td>36 (4.2%)</td>
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<tr>
<td>Kaposi sarcoma</td>
<td>29 (3.4%)</td>
<td>4/6 (66.7%)</td>
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<tr>
<td>Melanoma</td>
<td>26 (3.0%)</td>
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<tr>
<td>Ovary</td>
<td>19 (2.2%)</td>
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<tr>
<td>Penis</td>
<td>15 (1.7%)</td>
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<tr>
<td>Colorectal</td>
<td>13 (1.5%)</td>
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</tr>
<tr>
<td>Other</td>
<td>169 (19.6%)</td>
<td>1/6 (16.7%)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>N=1039</td>
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<tr>
<th>Variable</th>
<th>Premalignant/malignant</th>
<th>Malignant only</th>
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<tr>
<td></td>
<td>Bivariable OR* (95% CI)</td>
<td>Multivariable OR** (95% CI)</td>
</tr>
<tr>
<td>Age, per decade</td>
<td>1.21 (1.16-1.26)</td>
<td>1.24 (1.07-1.44)</td>
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<td>Female gender</td>
<td>0.92 (0.78-1.08)</td>
<td>0.75 (0.45-1.27)</td>
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<td>HIV infection</td>
<td>1.28 (0.81-2.03)</td>
<td>1.48 (0.92-2.40)</td>
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