Choosing and completing a Resident Research Project
Why research – educational

- Fulfills ACGME expectations
  - Involved in scholarly activities
  - Advance knowledge of basic principles of research
- Be able to critically assess validity of a manuscript
- Gain knowledge on methods of research to incorporate into your career, if desired
- Be able to communicate with scientist collaborators
- Gain an understanding of the difficulty in conducting sound research
- Be able to communicate with patients and communities about the challenges in a field
Why a research – practicalities

- Greatly increase chance for academic position or fellowship after residency
- Learn to what extent (if any) you would like to incorporate research into your career
- Opportunity for travel / awards
- Establish yourself as an asset to a program
Don’t be intimidated

Thomas Edison:
Genius is 1% inspiration and 99% perspiration
Don’t underestimate the significance of your work

- Schmeler principle
  - Reading guidelines for management of patients with Lynch syndrome
  - Guidelines could not recommend hysterectomy because there was no data
  - Research project: Does hysterectomy reduce the incidence of uterine cancer? (Really!!??)

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Prophylactic Surgery to Reduce the Risk of Gynecologic Cancers in the Lynch Syndrome

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# Program Timeline

## PGY1
- IRB training
- Identify potential faculty mentors, discuss opportunities
- Identify clinical or scientific areas of interest
- Assess areas of need and unanswered questions
- Literature review of topic
- Meet with Research Director to discuss (June)
- Assess career interests

## PGY2
- Renew IRB training
- Select research topic and mentor
- Notify Research Director of Mentor and Topic
  - Due about end of October
- Develop research protocol (study design, data collection/databases, statistical analyses)
- Submit IRB application
- Submit abstract for PGY2 RRD presentation
  - Due about end of January
- Present research protocol at February RRD
- Incorporate any changes based on presentation
  - Revise IRB if necessary
- Begin research study

## PGY3
- Renew IRB training
- Complete research study
- Submit interim report
  - Due about end of October
- Complete data analyses
- Submit abstract for senior RRD
  - Prelim about early April, final early May
- Present results at senior RRD in June

## PGY4
- Write manuscript
- Submit manuscript for publication
  - Due about early April
Choosing a project – getting started

- **Best:**
  - Choose a project and find mentor to assist
- **Good:**
  - Choose mentor and discuss projects
  - Choose career path and find mentor to guide
- **Less desirable:**
  - Jump into canned project just to get something done – just make sure it’s interesting to you
Developing a Project

- Listen for when we are divided on what to do
- Tumor board
- M&M
- Buzz phrases on rounds or conference:
  - “Why don’t we…”
  - “In this case…”
  - “I wonder if…”
- Don’t be afraid to ask if a plan of action is based on literature (start with your chief)
  - There will never be a better time to be stupid
- Read

“What gets us into trouble isn’t what we don’t know. It’s what we know for sure that just ain’t so.” – Mark Twain
Choosing a sound project – characteristics

- Choose a topic you are passionate about
  - Try not to make this a means to an end
- If considering fellowship, ideal to be in that specialty (scientific and mentor relationship)
- Feasibility
  - Time required
  - Assets in place to conduct study
  - Appropriately powered (number of patients/samples)
- Of scientific merit – holds interest, increased acceptance to meetings and journals
  - Avoid “me too” studies
Choosing a sound project – how ambitious

- Tempting to attempt to solve a problem
- It’s better to have a small-in-scope project that definitively answers a question than an incomplete attempt to answer a bigger question
  - Feasible endpoints within a bigger question
  - Example: Is magnesium an effective tocolytic?
    - What are potential endpoints?
      - Ideal: Morbidity of infant (neurologic function) and mother
      - Feasible: Number of contractions, time to delivery
Developing a sound design—lessons from writing grants

- Novel
  - Approach an old problem in a new way
  - Often use new technologies

- Have an impact
  - What you prove should advance the field, or have an effect on patient care

- The scientific method answers the hypothesis
  - The data generated must answer the question

- You are uniquely positioned to answer the question

- The investigator/team have the experience to carry out the project, facilities are in place, and there is support from the Department/Institution
Common grant/project criticisms

- Overly ambitious
- Vague hypothesis (let’s look and see what we can find that’s useful)
  - “Fishing expedition”
  - Want to stay focused
    - Poor: Identify the effects of magnesium on preterm labor
    - Better: Identify the effects of magnesium on contractions
- Research design generates data that doesn’t really answer the hypothesis
  - Example: Claim you are testing the best tocolytic to reduce neonatal morbidity but just look at effects on contractions
- Lack of statistical analysis
  - Study may be underpowered to answer the question
  - Data generated may not be analyzable with conventional statistical methods (need a p-value)
- Descriptive – no intervention, or eval of single cohort
Begin with the end in mind
- Think about the endpoints – need to be numbers
- Power analysis
  - Get statistician involved if mentor can’t assist

Start on time-dependent events early
- IRB – know the deadlines (about 20th of the month)
  - Call them for advice if unsure of any aspect
- Pulling charts – searching database – order supplies
- Anything that requires someone else’s effort
Background
  ◦ Briefly state what’s known, the gap in knowledge, and the data that leads to the hypothesis

Hypothesis – must be clearly stated
  ◦ Statement of fact that is to be proven or disproven

Specific Aims – what you are going to discover that will confirm/refute the hypothesis
  ◦ “To determine”, “To evaluate”, “To examine”

Experimental Design – the experiments that you are going to do to prove your Aims
  ◦ Must include mention of statistics / power analysis
    ◦ Hard to have a good study without a p-value

Anticipated results

Potential pitfalls / alternative plan

Summary (PGY2) or Conclusions (PGY3)
Example

- Background:
  - Preterm labor is a frequent problem with high morbidity but the most effective tocolytic is not known

- Hypothesis
  - Magnesium is more effective than terbutaline in decreasing frequency and intensity of uterine contractions

- Specific Aim
  - To determine the effects of magnesium and terbutaline on the contraction pattern of patients with preterm labor

- Experimental design
  - Primary endpoint: In women presenting with preterm labor, measure the number of contractions in each 30-minute window for 24 hours after initiating tocolysis
    - Compare mean/S.D. with student’s t-test
    - Power analysis: Based on predicted 25–75% reduction in # of contractions within 3 hours of medication, will need 27 patients to have 80% chance of discovering a difference
  - Secondary endpoint: time to delivery, infant mortality