Optimizing Resident Education: Strategies and Evidence

Graham McMahon MD MMSc
Dept. of Medicine, Brigham and Women’s Hospital & Harvard Medical School
Residency is an essential dimension of the transformation of the medical student to the independent practitioner along the continuum of medical education.

It is physically, emotionally, and intellectually demanding, and requires extensive, concentrated effort.
Effective Residency Training Requires…

- Broad and deep clinical exposure
- Progressive responsibility
- Oversight and teaching from more experienced faculty
- A broad curriculum
- Assessment and feedback
# Residency Programs in the US and Japan

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians</td>
<td>~820,000</td>
<td>~278,000</td>
</tr>
<tr>
<td>PGY 1 Residents</td>
<td>26,218</td>
<td>7,998</td>
</tr>
<tr>
<td>Teaching Hospitals</td>
<td>680</td>
<td>1,029</td>
</tr>
<tr>
<td>Residency Programs</td>
<td>8,800</td>
<td>1,418</td>
</tr>
</tbody>
</table>
## Length of residency training

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>21k</td>
<td>Medicine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8k</td>
<td>Pediatrics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5k</td>
<td>Obstetrics &amp; Gynecology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7k</td>
<td>Surgery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5k</td>
<td>Pre</td>
<td>Psychiatry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5k</td>
<td>Pre</td>
<td>Emergency Medicine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4k</td>
<td>Pre</td>
<td>Radiology</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Medical specialty training

**Medical Residency Plus**

- **3 years for**
  - Cardiology (4 for subspec)
  - Gastroenterology
  - Pulmonary/critical care
  - Hematology/oncology

- **1 year for**
  - Critical care
  - Geriatric medicine
  - Sports medicine

- **2 years for**
  - Nephrology
  - Endocrinology
  - Pulmonary
  - Rheumatology
  - Infectious disease
  - Oncology
  - Hematology
TRENDS IN US RESIDENCY
Increasing Competition

Applicants and 1st Year Positions in the Match

- Total Applicants
- Total PGY-1 Positions

Graph showing the increase in applicants and positions from 1952 to 2009.
Match Rate by Applicant Type

Percent Matched

U.S. Seniors

Others

U.S. IMGs

Non-U.S. IMGs

Percent Matches

U.S. Seniors
- First Rank: 53.2%
- Second Rank: 15.3%
- Third Rank: 8.7%
- >Fourth Rank: 12.1%
- Unmatched: 5.7%

Independent Applicants
- First Rank: 24.6%
- Second Rank: 10.2%
- Third Rank: 6.0%
- Fourth Rank: 3.5%
- >Fourth Rank: 6.2%
- Unmatched: 49.6%
Relative prevalence of IMGs among physicians in America

Physician Characteristics and Distribution, AMA, 2009ed
Trends in US residencies

- **Progressive**
  - **Decline** in preferences for primary care (especially family medicine)
  - **Rise** in preferences for dermatology, radiation oncology, and ophthalmology

- These reflect financial and quality of life incentives associated with these fields
<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>Teaching</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td></td>
<td>915</td>
<td>114</td>
</tr>
<tr>
<td>Programs</td>
<td></td>
<td>1028</td>
<td>390</td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td>5570</td>
<td>5122</td>
</tr>
<tr>
<td>Matched</td>
<td></td>
<td>4170 (74%)</td>
<td>3828 (74%)</td>
</tr>
<tr>
<td>Vacancies</td>
<td></td>
<td>1400</td>
<td>1294</td>
</tr>
<tr>
<td>Fraction matching to #1 preference</td>
<td></td>
<td>82%</td>
<td>78%</td>
</tr>
</tbody>
</table>
Match Rate to Japanese University Programs

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>8166</td>
<td>7756</td>
<td>8000</td>
<td>8100</td>
<td>8094</td>
<td>8030</td>
<td>7875</td>
<td>7998</td>
</tr>
<tr>
<td>University</td>
<td>72.5</td>
<td>58.8</td>
<td>49.2</td>
<td>44.7</td>
<td>45.3</td>
<td>46.4</td>
<td>46.8</td>
<td>47.9</td>
</tr>
<tr>
<td>Unfilled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1035</td>
<td>1294</td>
</tr>
</tbody>
</table>

- Reasons given for choosing teaching programs:
  - Better teaching
  - Less administration

- Reasons given for choosing university programs:
  - Access to post-graduate training
  - Reputation
RESIDENCY OVERSIGHT
Organization of Residency Programs in the USA

ACGME

- Federally funded
- Sets standards
- Issues approvals and citations
- ACGME accreditation necessary for
  - Board certification
  - State licensure
  - Funding for resident salaries
Organization of Residency Programs in the USA

- Residency Review Committee
  - Convened by ACGME
  - Sets standards for each type of program
  - Approves size of the program
  - Investigates complaints
  - Formally inspects programs
    - Review of documents
    - Inspection of facilities
    - Interviews with director, faculty and trainees
  - Publicly publishes reports
Accreditation Cycle Lengths

<table>
<thead>
<tr>
<th>Cycle Length</th>
<th>Program Count</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>165</td>
<td>2%</td>
</tr>
<tr>
<td>2 years</td>
<td>671</td>
<td>8%</td>
</tr>
<tr>
<td>3 years</td>
<td>1,676</td>
<td>19%</td>
</tr>
<tr>
<td>4 years</td>
<td>1,501</td>
<td>17%</td>
</tr>
<tr>
<td>5 years</td>
<td>3,703</td>
<td>43%</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>993</td>
<td>11%</td>
</tr>
</tbody>
</table>
Organization of Residency Programs in the USA

- **Sponsoring Institution**
  - Must demonstrate a commitment to education sufficient to support the program
  - Provide faculty, facilities, and resources for education, clinical care and research as directed by the program director
  - Provide 50% salary support for the program director
  - Provide 20% salary support for any associate program directors
Organization of Residency Programs in the USA

Program Director

- One person, board-certified and based at the institution
- Responsible for establishing and maintaining the educational environment
  - Select residents
  - Select and supervise teaching faculty
  - Ensure balance of service and education
  - Oversee resident evaluation and feedback
  - Implement fair policies and grievance procedures
- Responsible for periodic formal reports
Residents

- Hours
- Workload
- Clinical Exposure
- Supervision & feedback
- Teaching
Organization of Residency Programs in the USA

Program Curriculum

- Written document
- Distributed widely
- Lists knowledge skills and other attributes to be attained during each assignment at each level.
- Lists pedagogy for each competency
- Provides an opportunity for residents to engage in scholarship
Organization of Residency Programs in the USA

- Clinical Exposure
  - At least 33% of training time spent in ambulatory care (108 weekly continuity sessions)
  - Up to 3 months in emergency medicine
  - Adequate exposure to all of the major disciplines of medicine
Organization of Residency Programs in the USA

Volume

- No more than 5 new pts per admitting day
- No more than 12 pts at any time
- No more than 5 pts in a half-day ambulatory session
Organization of Residency Programs in the USA

Hours

- No more than 80 hrs per week
- No more than 16 hrs per shift for PGY1s
- No more than 24 hrs per shift for others (+4hrs to transfer care)
- On call overnight no more than every 3rd day
- At least one full 24 hrs off per 7 day period
Organization of Residency Programs in the USA

- **Supervision**
  - Faculty functioning as supervising physicians should delegate portions of that care to resident physicians.
  - PGY1 residents must have an attending with them, or at minimum in the building at all times of the day and night.
  - Senior residents should serve in a supervisory role of junior residents.
## Differences in Residency Regulation in US and Japan

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residency completion required for license</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Residency programs are inspected</td>
<td>✔</td>
<td>✗/✔</td>
</tr>
<tr>
<td>Work-hour standards are enforced</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>Quality standards are enforced</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>Results are made public and known to applicants</td>
<td>✔</td>
<td>✗</td>
</tr>
</tbody>
</table>
WORK HOURS
Table 3. Incidence of Serious Medical Errors.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Traditional Schedule</th>
<th>Intervention Schedule</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious medical errors made by interns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious medical errors</td>
<td>176 (136.0)</td>
<td>91 (100.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Preventable adverse events</td>
<td>27 (20.9)</td>
<td>15 (16.5)</td>
<td>0.21</td>
</tr>
<tr>
<td>Intercepted serious errors</td>
<td>91 (70.3)</td>
<td>50 (55.0)</td>
<td>0.02</td>
</tr>
<tr>
<td>Nonintercepted serious errors</td>
<td>58 (44.8)</td>
<td>26 (28.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Types of serious medical errors made by interns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medication</td>
<td>129 (99.7)</td>
<td>75 (82.5)</td>
<td>0.03</td>
</tr>
<tr>
<td>Procedural</td>
<td>11 (8.5)</td>
<td>6 (6.6)</td>
<td>0.34</td>
</tr>
<tr>
<td>Diagnostic</td>
<td>24 (18.6)</td>
<td>3 (3.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Other</td>
<td>12 (9.3)</td>
<td>7 (7.7)</td>
<td>0.47</td>
</tr>
</tbody>
</table>
Mean (+SE) Number of Attentional Failures among the 20 Interns as a Group and Individually while Working Overnight (11 p.m. to 7 a.m.) during the Traditional Schedule and the Intervention Schedule.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Extended Work Shifts (≥24 hr)</th>
<th>Nonextended Work Shifts (&lt;24 hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crashes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. reported</td>
<td>58</td>
<td>73</td>
</tr>
<tr>
<td>No. of commutes</td>
<td>54,121</td>
<td>180,289</td>
</tr>
<tr>
<td>Rate (per 1000 commutes)</td>
<td>1.07</td>
<td>0.40</td>
</tr>
<tr>
<td>Odds ratio (95% CI)</td>
<td>2.3 (1.6–3.3)</td>
<td>1.0</td>
</tr>
<tr>
<td>Near-miss incidents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. reported</td>
<td>1,971</td>
<td>1,156</td>
</tr>
<tr>
<td>No. of commutes</td>
<td>54,121</td>
<td>180,289</td>
</tr>
<tr>
<td>Rate (per 1000 commutes)</td>
<td>36.42</td>
<td>6.41</td>
</tr>
<tr>
<td>Odds ratio (95% CI)</td>
<td>5.9 (5.4–6.3)</td>
<td>1.0</td>
</tr>
</tbody>
</table>

http://jama.ama-assn.org/cgi/data/303/8/747/DC1/1
Changes in Work and Sleep from 1999 to 2009 by Specialty

**Average Weekly Work Hours**

- **PGY1 (1999):**
  - Surgery: 102.0
  - OB/Gyn: 90.5
  - Pediatrics: 83.7
  - Internal Medicine: 81.3

- **PGY1 (2009):**
  - Surgery: 83.9
  - OB/Gyn: 78.0
  - Pediatrics: 78.1
  - Internal Medicine: 73.9

- **PGY2 (1999):**
  - Surgery: 105.7
  - OB/Gyn: 90.8
  - Pediatrics: 77.1
  - Internal Medicine: 70.2

- **PGY2 (2009):**
  - Surgery: 82.0
  - OB/Gyn: 76.8
  - Pediatrics: 72.1
  - Internal Medicine: 70.2

**Average Weekly Sleep Hours**

- **PGY1 (1999):**
  - Internal Medicine: 40.7
  - Pediatrics: 39.9
  - OB/Gyn: 38.9
  - Surgery: 35.4

- **PGY1 (2009):**
  - Internal Medicine: 43.8
  - Pediatrics: 43.3
  - OB/Gyn: 42.2
  - Surgery: 41.8

- **PGY2 (1999):**
  - Internal Medicine: 42.0
  - Pediatrics: 40.9
  - OB/Gyn: 39.4
  - Surgery: 33.7

- **PGY2 (2009):**
  - Internal Medicine: 46.0
  - Pediatrics: 43.5
  - OB/Gyn: 40.8
  - Surgery: 40.8
Figure 1. Changes over time in unadjusted mortality for very high severity patients in hospitals of different teaching intensity.
Readmission Rates over Time

Combined Medical Group

Combined Surgical Group

Year

Pre3 Pre2 Pre1 Post1 Post2 Pre3 Pre2 Pre1 Post1 Post2

Readmission rate, %

Very major
Very minor
Major
Nonteaching hospital
Minor

Press MJ. JGIM 2010 online first
Standardized Mortality Ratios in UK following reduction in Hours

NHS North West & England HSMRs from April 2006 to August 2009 with 2005 Benchmarks

Reduced hours in SHA only

Q J Med 2010; 103:929–940
STRATEGIES FOR TEACHERS
Resident Hours

Teaching

Supervision & feedback

Clinical Exposure

Workload
Key Principles of Effective Clinical Education

- Let the trainee decide what to do before correcting them
- Think out loud
- Teach with patients
- Encourage trainees; avoid embarrassment
- Don’t lecture: use Q&A
- Make time for feedback
“To study the phenomenon of disease without books is to sail an uncharted sea, while to study books without patients is not to go to sea at all”

• Osler, 1903
Advantages of Bedside Teaching

- Adult learning principles
  - Active involvement
  - Relevant, meaningful
- Patients like it
- Motivates learners
- Important domains of learning integrated through teaching, role modeling & observation with feedback
Preferences for Bedside Presentations

FIGURE 1. Percentages of respondents preferring the bedside for case presentations.
Patients’ Reactions

- 86%: it increased my understanding of my medical problems,
- 77%: I enjoyed it (only 17% did not)
- 83%: It did not make me anxious,
- 85%: I do not think that bedside teaching breaches confidentiality
- 84%: I would recommend bedside teaching to other patients.
Perceptions of Residents and their Attendings

- Residents want more time at the bedside with faculty (94%)
- Attendings want to make bedside teaching a priority (78% vs. 22%)
- Attendings lack confidence in bedside teaching (33%), esp in physical exam (50%), and few have been trained (33%)

THE CLINICAL IMPACT OF TRAINING CHANGES: ONE EXPERIMENT
Extended resident work hours and increased on-call workload have been associated with

- fatigue-related errors,
- resident dissatisfaction, and
- reduced participation in educational activities

We hypothesized that changing resident workload and supervision within established duty-hour limits could improve care quality.
Redesigning Our Teams

Focus Groups with Residents

Key themes:
Workload, Continuity, Relationships

Inclusive Redesign Committee

Hospital Funding & Metric Selection
Daily Schedule

- 7:30-9:30am: Team Work Rounds
- 9:30-10:30am: Morning Report
- 10:30-12noon: Pt care/enhanced education
- 12-1pm: Resident led teaching
- 1-2pm: Pt care/enhanced education
- 3-4pm: Attending led teaching
- 4-4:30pm: Radiology Rounds
On-call schedule

- **Interns**
  - On call overnight every 6\(^{th}\) night

- **Residents**
  - On call until 10pm every 4\(^{th}\) night
  - Overnight coverage by night resident
# Team Differences

<table>
<thead>
<tr>
<th></th>
<th>ITU</th>
<th>GMS (control)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Team Structure</strong></td>
<td>2 residents 3 interns</td>
<td>1 resident 2 interns</td>
</tr>
<tr>
<td><strong>Supervision</strong></td>
<td>2 co-attgs present on site</td>
<td>Multiple care attgs Variable contact</td>
</tr>
<tr>
<td><strong>Workload</strong></td>
<td>Max census of 15 pts (~4-5 pts per intern)</td>
<td>Max census per ACGME limits (~6-8 pts per intern)</td>
</tr>
</tbody>
</table>

- **Attending**
- **Resident(s)**
- **Interns**
Team Similarities

- All teams on one hospital floor
- Same nurses and other professionals
- Same residents rotated through each team
- Duty hours similar
- Attendings included hospitalists, generalists, and subspecialty attendings
Trial Schema

2 GMS teams

2 ITU teams

Outcomes:
• Patient mortality
• Length of stay
• Readmission rate
• Resident activity
• D/c summary quality
• Attending, resident and patient satisfaction

Unselected medical patients

1 year
## Resident Activity

ITU residents spent much more of their time in educational activities than GMS residents.

<table>
<thead>
<tr>
<th></th>
<th>ITU</th>
<th>GMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Patient Care</td>
<td>12%</td>
<td>18%</td>
</tr>
<tr>
<td>Indirect Patient Care</td>
<td>36%</td>
<td>44%</td>
</tr>
<tr>
<td>Education**</td>
<td>29%</td>
<td>7%</td>
</tr>
<tr>
<td>Transitions of care</td>
<td>6%</td>
<td>11%</td>
</tr>
<tr>
<td>Other</td>
<td>17%</td>
<td>20%</td>
</tr>
</tbody>
</table>

**P=0.003**
## Resident Survey Data

<table>
<thead>
<tr>
<th></th>
<th>ITU</th>
<th>GMS</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Residents Returning surveys</td>
<td>98</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Number of Surveys</td>
<td>104</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td><strong>I agree with this statement (mean % agreement):</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I enjoyed the rotation</td>
<td>77.9</td>
<td>54.8</td>
<td>0.002</td>
</tr>
<tr>
<td>This rotation was closest to an ideal residency experience</td>
<td>41.4</td>
<td>6.4</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>I had more follow-up than usual</td>
<td>22.1</td>
<td>8.1</td>
<td>0.02</td>
</tr>
<tr>
<td>I learned new physical exam skills</td>
<td>77.9</td>
<td>30.6</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>I received feedback from my attending</td>
<td>85.6</td>
<td>30.6</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td><strong>I learned a lot from this activity this month (mean % agreement)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morning report</td>
<td>95.1</td>
<td>58.3</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>My attendings on rounds</td>
<td>83.6</td>
<td>66.1</td>
<td>0.009</td>
</tr>
<tr>
<td>Preparing teaching topics</td>
<td>78.9</td>
<td>74.4</td>
<td>0.59</td>
</tr>
<tr>
<td>Resident-led didactics</td>
<td>80.0</td>
<td>44.1</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>
Quality of Discharge Summaries

- Blinded evaluation of 142 random discharge summaries

Fraction of reports with all the required elements:

<table>
<thead>
<tr>
<th>Category</th>
<th>Traditional Teams</th>
<th>ITU Teams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Histories</td>
<td>12.5%</td>
<td>28.6%</td>
</tr>
<tr>
<td>Medications</td>
<td>15.2%</td>
<td>25.7%</td>
</tr>
<tr>
<td>Discharge Planning</td>
<td>5.6%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Inpatient Narrative</td>
<td>22.2%</td>
<td>47.2%</td>
</tr>
<tr>
<td>Communications</td>
<td>6.9%</td>
<td>24.3%</td>
</tr>
</tbody>
</table>

P-values:
- Histories: P=0.023
- Medications: P=0.147
- Discharge Planning: P=0.012
- Inpatient Narrative: P=0.003
- Communications: P=0.005
<table>
<thead>
<tr>
<th></th>
<th>ITU</th>
<th>GMS</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Patients</strong></td>
<td>1892</td>
<td>2096</td>
<td></td>
</tr>
<tr>
<td><strong>% Female</strong></td>
<td>58.0%</td>
<td>60.0%</td>
<td>0.13</td>
</tr>
<tr>
<td><strong>Race Category</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>78.0%</td>
<td>80.7%</td>
<td>0.11</td>
</tr>
<tr>
<td>African-American</td>
<td>14.1%</td>
<td>13.3%</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>4.9%</td>
<td>3.8%</td>
<td></td>
</tr>
<tr>
<td>All Others Declared</td>
<td>3.0%</td>
<td>2.2%</td>
<td></td>
</tr>
<tr>
<td><strong>Mean age (sd)</strong></td>
<td>68.9 (17.6)</td>
<td>69.6 (17.2)</td>
<td>0.22</td>
</tr>
<tr>
<td><strong>Insurance</strong></td>
<td></td>
<td></td>
<td>0.29</td>
</tr>
<tr>
<td>Private</td>
<td>37.7%</td>
<td>39.6%</td>
<td></td>
</tr>
<tr>
<td>Medicare</td>
<td>32.3%</td>
<td>33.2%</td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>25.9%</td>
<td>23.5%</td>
<td></td>
</tr>
<tr>
<td>No insurance</td>
<td>4.0%</td>
<td>3.7%</td>
<td></td>
</tr>
<tr>
<td><strong>Diagnosis Category</strong></td>
<td></td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>17.2%</td>
<td>15.1%</td>
<td></td>
</tr>
<tr>
<td>Pulmonary</td>
<td>15.8%</td>
<td>15.0%</td>
<td></td>
</tr>
<tr>
<td>Gastronenterology</td>
<td>12.7%</td>
<td>15.2%</td>
<td></td>
</tr>
<tr>
<td>Renal</td>
<td>8.3%</td>
<td>7.3%</td>
<td></td>
</tr>
</tbody>
</table>
# Primary Results

<table>
<thead>
<tr>
<th>Metric</th>
<th>ITU</th>
<th>GMS</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge Volume (number of patients)</td>
<td>1892</td>
<td>2096</td>
<td></td>
</tr>
<tr>
<td>Mean daily census per first-year resident</td>
<td>3.5</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>In-patient mortality (%)</td>
<td>1.4</td>
<td>2.2</td>
<td>0.04</td>
</tr>
<tr>
<td>Expected mortality (%)</td>
<td>1.7</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>O/E Mortality Ratio</td>
<td>0.79</td>
<td>1.26</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Average LOS (mean days [se])</td>
<td>4.1 (.09)</td>
<td>4.6 (.10)</td>
<td>0.0002</td>
</tr>
<tr>
<td>Expected LOS (mean days)</td>
<td>4.0</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>O/E LOS Ratio</td>
<td>1.03</td>
<td>1.15</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Readmissions within 30 days (%)</td>
<td>6.9</td>
<td>8.0</td>
<td>0.19</td>
</tr>
</tbody>
</table>

*O/E = observed to expected; LOS = length of stay*
Experimental Conclusions

- As compared to a typical inpatient care model, reduced intern workload within a restructured team model was associated with:
  - Significantly increased time for educational activities
  - Significantly lower inpatient mortality and length of stay,
  - Significantly higher attending and resident satisfaction

- Investment in trainees results in higher quality of care
Conclusions 1

- Residency training is complex for administrators and challenging for residents.
- Residents' professional commitment to their patients will naturally take precedence over educational imperatives.
- Programs must structure their programs so that residents have time to learn:
  - Appropriate workhour and workload limits
  - Supervision and feedback
- Attention to educational quality improves care quality and patient outcomes.
Conclusions 2

- If quality of GME is to improve in Japan
  - Quality standards must be further developed (workload, work hours, teaching, supervision)
  - Additional independent assessment of programs is necessary
  - Adherence to standards must be measured and reported
  - Failure to meet standards must have consequences
  - Reports must be published, accessible to applicants
  - Teaching skills must be developed

- Improved GME quality will improve patient care quality and outcomes
Hours

Teaching

Supervision & feedback

Clinical Exposure

Workload