Thanks to all who contribute to sharing MHIF research at important conferences:

**TCT:** 25 presentations; 15 sessions as moderators/discussants; 5 training session leaders; 1 live case panelist; and 12 posters!

**ELSO:** 21 presentations; 3 posters; 1 oral abstract presented by an MHIF intern!

MHIF Heartbeat Gala – Oct. 13, 2018
Join us for an evening of inspiration to benefit MHIF research and education!

REGISTER TODAY: Mplsheart.org/gala

**FEATURING MHIF STUDIES**
Open for Enrollment and Referrals!

- **AEGIS** for acute coronary syndrome
- **TRANSCEND** for peripheral artery disease
- **ASAP-SVG** for coronary artery disease

**CONGRATULATIONS FOR FIRST PATIENT ENROLLMENTS!**

*Dr. Knickelbine and Stephanie Ebnet* for the AEGIS trial

*Dr. Gössl and Sara Olson* for Prelude (mitral valve replacement study)

*Dr. Gössl and Karen Meyer* for TVINCITIES study (racial and ethnic disparities in valve disease)

**PUBLISHED**

*Structural Heart Cases: A Color Atlas of Pearls and Pitfalls*
by Dr. Paul Sorajja

*Manual of Coronary CTO Interventions*
by Dr. Emmanouil Brilakis
A Hospitalization for Heart Failure

- Control group
- Device group

Hazard ratio, 0.53 (95% CI, 0.40–0.70)
P<0.001

No. at Risk
- Control group: 312, 294, 271, 245, 219, 176, 145, 121, 88
- Device group: 302, 286, 269, 253, 236, 191, 178, 161, 124

B Freedom from Device-Related Complications

- (lower 95% confidence limit) 94.8
- (performance goal) 88.0

P<0.001

No. at Risk
- Device group: 293, 283, 282, 277, 272, 269, 261, 258, 251, 245, 241, 236, 221

Stone, G.W. et al. NEJM September 23, 2018; Transcatheter Mitral-Valve Repair in Patients with Heart Failure.  
Figure 1. Primary Effectiveness and Safety End Points and Death. Panel A shows the cumulative incidence of the primary effectiveness end point of all hospitalizations for heart failure within 24 months of follow-up among patients who underwent transcatheter mitral-valve repair and received guideline-directed medical therapy (device group) and among those who received guideline-directed medical therapy alone (control group). The data shown here do not account for the competing risk of death, which was considered in the joint frailty model. A total of 160 hospitalizations for heart failure occurred in 92 patients in the device group, and a total of 283 hospitalizations for heart failure occurred in 151 patients in the control group. Panel B shows the rate of the primary safety end point of freedom from device-related complications at 12 months among the 293 patients in whom device implantation was attempted, as compared with an objective performance goal. Panel C shows time-to-event curves for all-cause mortality in the device group and the control group.

Innovative Advanced Practice Provider (APP) Program Delivers Enhanced Patient-centered Care

Objectives

• Describe the APP role in identifying practice needs and creating a systematic role for personnel and protocols to improve health care delivery

• Identify how innovating cardiovascular care delivery by optimizing provider scope of practice mirrors scientific discovery and understanding

• Summarize guidelines and future directions for high quality and efficient care of cardiovascular patients referred for cardioversion or cardiac monitoring
Why?

When asked why we started the cardioversion program.....

Why not?

Where does it say who can/cannot push that button?
Objectives

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Wouldn’t it be better if...

• Free EP MD to perform complex procedures

• Create a dedicated and streamlined serviceline for easy patient referrals and increase patient volume

• Identify patients who are candidates for advanced EP therapies

• Expedite patient access to care

• Prevent patients from falling through the cracks
  – Arrange for appropriate follow-up
  – Optimal patient care with appropriate diagnostics for ongoing best-practice care
EP APP performing DCCV...

What is needed

• Experimentation with innovative concept
  – Practice collaboration
  – APP willing to step out of comfort zone

• System Support
  – EP & MHI Leadership
  – Anesthesia partners
  – Medical staff office & credentialing
  – Prep/recovery staff

To Err is Human

• Institute of Medicine released the report “To Err is Human: Building a safer Health System”

• Outcomes of the paper
  – Nationally/locally define events
  – Develop reporting systems
  – Necessity of individual accountability of health professionals with unacceptable, reckless behavior
  – Organizations held accountable for unsafe conditions
Most important message was initially lost in the report

Developing safety in patient care is more important than defining error

Freedom from accidental injury is the responsibility of a system

Improving safety in care requires...

Respecting abilities by developing processes that recognize our strengths and weaknesses.

Then capitalize on strengths
Refocus learning

Change the focus from individual growth within a practice to becoming a stronger system

The Grey Zone

- The space between all the disciplines
- This is where the most opportunity to optimize patient care is created
- It can also be the hardest to achieve as it typically requires a change of culture and tradition
Identification of EP Grey Zones

- Cardioversion (2009 EP only, 2013 all of MHI)
- Tilt Table Testing (2009)
- Implantable Loop Recorder Placement (2014)
- Implantable Loop Recorder Removal (2018)

Requires Collaboration to Optimize Care within this “zone”

Collaboration

- Term is commonly used to describe hierarchical relationships
- Collaborative team effort is often described as interdisciplinary structure with an MD as the supervisor of the team
True Collaboration

• Defined as: A partnership based on mutual respect for one another’s expertise, knowledge, and skills

• Territorial issues dissolve

• Collaboration is not determined by the independence of a provider

• Practice with a boss-dominated perspective becomes inefficient and we risk becoming less beneficial for our patients
Greatest Challenge

To learn, use, and share better information

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What is described as a scientific approach to medical experimentation to look at ectopic arrhythmias and the “excitable gap”
Discovering the Solution

• 1752 Ben Franklin was “knocked senseless several times by lightning”
  — Stated: “If there is no other use for discovered for electricity, this, however, is something considerable that it may help make a vain man humble?”

• 1775 a single shock (via Leyden jar) to a chicken resulted in lifelessness. A repeat shock given at which time the bird took off, eluding any further shocks

• 1879 brought the first accidental electrocution (development of commercially available electric power)
  — Later found that the majority of these deaths were due to ventricular fibrillation

• 1899 electrical currents were applied directly to the heart of dogs to induce vFib — only in the foot notes did it state that the charges could also terminate the vFib

• 1932 scientists looked at DC shock, but concluded that AC shocks gave “superior” results

• 1940 & 1947 study confirmed the effectiveness of defibrillating the exposed heart
  — Patients needed a thoracotomy and direct application of electrodes — limited usefulness

• 1960 looked at AC vs DC being used for rhythms other than vFib
  — This led to using A.C shock (transthoracic) to terminate refractory arrhythmias

Discovering the solution...

What we knew

• No standardized regimen for anticoagulation

• Scattered Cardiologist Workflow
  — Pulling from CV/EP lab, hospital service, special diagnostics (CT, MRI, Nuclear, Echo)

• Missed patient follow up
  — Variation in practice between providers, covering providers, communications/orders

• Precious resources: lab time, TEE, anesthesia, bedside nursing
  — 1 procedure at a time in 1 designated CV prep/recovery room, no oversight or guidelines followed (pre-, peri-, or post-procedure)
What others have taught us

• MHI CVDS - Dr. Hurrell
  — Integrated TEE guided cardioversions to be a single sedation procedure in CV prep/recovery
  — All elective cardioversions performed on 1 floor/unit for care

Seeing What We Have to Gain...

• Above all
  — provide the highest quality of care, efficiently, to our patients in a true collaborative practice

• In addition....
  — Develop professional expertise
  — Develop a program that pushed boundaries to develop the APP role in an innovative practice that would become tomorrows standard
  — Challenge traditional provider roles
A touch of what we think might work..

- Having an APP care for patients schedule for elective cardioversion procedure & perform the procedure.
  - Cardioversions were a clear grey zone in MHI’s CV practice and care delivery system

Program Growth

- 2009 started with cardiac EP patients
- 2013 formally expanded to all MHI patients
Delivery of care through safe and efficient care

- Changed the standard of care at ANW for patients undergoing a cardioversion procedure
- Improved the efficiency of the cardiologist and the APP
- Provide a “full service” evaluation
- Anticoagulation review from systematic approach to best-practice
- Better utilized anesthesia and bedside RN resources
- Optimize and enhance the APP through volume and experience

APP Directed Cardioversion Program Outcomes

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<td>% of cardioversion procedures that had a stroke within 48 hours (2 days) of cardioversion</td>
<td>0.12% (n=1)</td>
<td>0.22% (n=2)</td>
<td>0.24% (n=2)</td>
<td>0.11% (n=1)</td>
<td>0.30% (n=3)</td>
<td>0.28% (n=3)</td>
<td>0.39% (n=5)</td>
<td>0.37% (n=5)</td>
<td>0.20% (n=3)</td>
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Research incidence of stroke report at 0.6-1.8%
NP Run Outpatient Cardioversion Program
Stanford Health

• Program developed in 2012, published in 2016

• Retrospective study from 2009-6/2014
  – 557 subjects, underwent 869 DCCVs (5.5 years) = ~160 DCCV/year

• Demonstrated NP-run DCCV are safe and effective with results comparable to MD-run DCCVs.

Objectives

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Anticoagulation Guidelines

- 2009: only agents on market were warfarin & heparin products
- 2011 added NOAC (now DOAC)

Heparin Protocol

- Heparin protocols at ANW updated to include APTT
- Heparin protocol “hold” parameters
### Implantable Loop Recorder (LINQ)

- **Historically**
  - Conscious sedation, 90 minutes EP lab time, 2 EP techs, 1 RN, and 1 EP MD. This equated to 360 RVU time

- **New technology (LINQ)**
  - Simplified implant & MHI adapted to best care with fiscal responsibility
  - Moved procedure to CVOP room using local anesthetic, 1 RN, 1 APP, 30 minute procedure. Equates to 60 RVU time

- **Developed relationship with neurology team (Sherilyn Milner, NP & Dr. Young leads)**
  - Evidence based medicine – CRYSTAL AF trial with cryptogenic stroke patients
  - 34 REVEAL devices in 2014, almost 200 LINQs annually since 2015......growth and best patient care

### Implantable Loop Recorder (LINQ) Outcomes

- **Passed our 4 year anniversary of APP placing (~700 devices)**
  - <0.5% infection rate
  - Few devices removed early/2 repositioned due to patient request (irritation, 18 y.o., diagnosis made, well-endowed)

- **Cryptogenic Stroke – EP team/MHIF Intern study:**
  - 84 day average time to detection of arrhythmia
    - Changes therapy to full anticoagulation
  - 20-25% of patients diagnosed with cryptogenic stroke are found to have atrial arrhythmia on LINQ device
Implantable Loop Recorder (LINQ) Removals

- 2018 brought with it End of Life (EOL) for LINQ devices.....now what

- Gornickism of 2018:
  - “If you can put them in, you should take them out”

- Moved to Prep/recovery using APP and 1 assist
  - If we can feel it (all placed SQ), 1-2cc epi/lido, a 10-11mm incision, and hemostat
  - Concern raised for incision closure with steri-strips. Brought back 10+ patients to MHI for site check. All with uncomplicated healing

Dollars and Sense

- Simple math....
  - pay a cardiologist vs advanced practice provider to perform cardioversion, ILR, ILR removal
  - Revenue from EP MD to perform complex procedures
  - Access to care: increased patient volumes (cardioversions, ILR, and advanced EP procedures), EP lab availability for complex procedures, expedited patient access to care, easy scheduling, patient satisfaction

- Sense.....
  - Safe patient care, patient access to care, efficiency of practice, optimal utilization of precious resources, improved patient identification for advanced therapies, etc.
Take Home Points

• Describe the APP role in identifying practice needs and creating a systematic role for personnel and protocols to improve health care delivery

• Identify how innovating cardiovascular care delivery by optimizing provider scope of practice mirrors scientific discovery and understanding

• Summarize guidelines and future directions for high quality and efficient care of cardiovascular patients referred for cardioversion or cardiac monitoring