Interdisciplinary Care Models: Implementation strategies to address global unmet needs, including pragmatic approaches in resource-limited settings.
Disclosures

- Elke Eaton  I have Nothing to disclose
Patient Case

Mr. D. – Difficult Diabetes

• 64 y/o M with poorly controlled type 2 diabetes mellitus complicated by HFmrEF (non-ischemic, non-obstructive CAD), hypertension, Chronic Kidney Disease (CKD), class II obesity, obstructive sleep apnea, tobacco abuse, low health literacy and not technologically savvy

• Medications included:
  • ASA, rosuvastatin 40 mg, losartan 100 mg, glimepiride 4 mg bid
# CINEMA Laboratory Values

<table>
<thead>
<tr>
<th>Biomarker</th>
<th>Baseline CINEMA Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb A1c</td>
<td>11.3%</td>
</tr>
<tr>
<td>BMI</td>
<td>34 kg/m²</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>142/90 mmHg</td>
</tr>
<tr>
<td>LDL-C</td>
<td>63 mg/dl</td>
</tr>
<tr>
<td>UACR</td>
<td>60 mg/g</td>
</tr>
<tr>
<td>eGFR</td>
<td>59 ml/min/1.73m²</td>
</tr>
<tr>
<td>LVEF</td>
<td>45% on Echo</td>
</tr>
<tr>
<td>Fib 4 Score (for NAFLD)</td>
<td>1.72</td>
</tr>
</tbody>
</table>

**CAC Score of 785**

*UH has a No Charge Calcium Scoring Program*

The patient has never had a Urine Microalbumin checked! Retinal Exams Were not done in over 3 years No Podiatry Evaluation!

Goals of Care in Cardiometabolic Disease

- Best accomplished by preventing morbid complications
- Cardiovascular disease and Diabetic Kidney Disease are the two most common and morbid complications of Type 2 Diabetes.
- Many patients are not aware of their risk for these complications
- Reduce cardiovascular events
Diabetes is a major global threat
A growing medical problem associated with high mortality.

Deaths due to diabetes (20–79 years) in 2017

Growing global prevalence of diabetes

Diabetes accounted for ~4.0 million deaths and cost ~$727 billion (USD) in health spending in 2017

Awareness, Treatment and Control of Diabetes in US Adults

- Treated and Controlled: 21%
- Treated and Uncontrolled: 45%
- Not Treated, but Aware: 9%
- Not Treated and Undiagnosed: 25%

80% of all adults are either uncontrolled, untreated or unaware.

Heart Disease and Stroke Statistics 2020
Fragmented and “siloed” care is the norm in people with Type 2 Diabetes leading to defects in care

- On an average a Type 2 diabetic may see 3-5 specialists including their PCP
- Substantial delays in care leading to inadequate glycemic and risk factor control is often the norm
- Many patients with Type 2 diabetes lack the support systems for adequate control

Eliminating Missed Opportunities in the Care of Patients with or at Risk for Type 2 Diabetes. Rajagopalan S, Pronovost P, Neeland I. Trends in Endocrinology and Metabolism 2021.
The UH CINEMA Way…
Who is Ideal for UH CINEMA?

Diagnosed with Type 2 Diabetes or Prediabetes and one of the following:

- **Cardiovascular disease**
  - Heart attack, stroke, heart failure, coronary artery disease, peripheral artery disease

- **Chronic kidney disease**

- **Elevated coronary artery calcium score**
  - (greater than 100)

- **Risk factor for heart disease**
  - High blood pressure, high cholesterol, Overweight, or obesity with metabolic syndrome
CINEMA Targets

Reduction in CV events...

• Glycemic control
  • Lifestyle, medication, CGM

• Body weight control
  • Lifestyle, GLP-1 RA, CGM

• Cholesterol control
  • Maximize lipid-lowering therapies

• CKD progression control
  • BP, ACEi/ARB, SGLT2i, non-steroidal MRA
CINEMA Patient Appointment Work Flow

Pre-Appointment

- Reviews individual patient medical history and determines pre-appointment labs to create personalized treatment plan.
- Sends detailed communication to both patient and care team on what to expect at upcoming appointment.

Appointment Day

- Assessment with certified diabetes care specialist.
- Review lifestyle, diet, exercise, and other factors.
- Provides education and sets goals with patient for their disease management.

Post Appointment

- Assessment with physician to review:
  - Patient medical history
  - Risk reduction strategies
  - Patient goals for disease management
  - Usage of new medications

- Discuss next steps and follow up appointments, provide education and medication teachings, and schedules needed labs/tests.
- Resources/videos sent to patient.

Usual visit schedule: Initial Visit → 3 months follow-up → 3-6 months follow-up → 1 year Encore visit
CINEMA Lifestyle Education

Educational Talks
Every Monday from 5:30 – 6:15 p.m.
via Zoom invitation

Resistance Band Exercise Class
Every Tuesday at 12:00 p.m.
via Zoom invitation

<table>
<thead>
<tr>
<th>FOCUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating Patterns for Diabetes</td>
</tr>
<tr>
<td>Exercise and Diabetes</td>
</tr>
<tr>
<td>Holidays and Diabetes</td>
</tr>
<tr>
<td>Diabetes Causes and Risk Factors</td>
</tr>
<tr>
<td>Diabetes: Sex, Smoking and Sleep</td>
</tr>
<tr>
<td>Eating on the Run/Dining Out with Diabetes</td>
</tr>
<tr>
<td>High Cholesterol/High Blood Pressure and Diabetes</td>
</tr>
<tr>
<td>Diabetes Medications</td>
</tr>
<tr>
<td>Diabetes and Mental Health</td>
</tr>
<tr>
<td>Healthy Cooking and Recipe Modification</td>
</tr>
<tr>
<td>Foot and Vision Care for Patients with Diabetes</td>
</tr>
<tr>
<td>Lab Tests and Blood Glucose Monitoring</td>
</tr>
</tbody>
</table>
Quarterly In Person Support Meetings

- Meet every three months from 12-2 pm.
- An opportunity for patients to share personal experiences, feelings, coping strategies and firsthand information about disease or treatment

**Topic Driven:**
- Podiatrist: Foot care
- Chef: Timesaving tips
- Blood glucose monitoring
- Stress management
- Exercise physiologist
UH CINEMA Patient Education Videos and Webinars
Pharmacy Services

- New medication counseling
- Virtual follow-up
- Medication optimization
- Prior authorization assistance
- Financial assistance
- Home delivery services
- Medication and lifestyle education series
### Mr. D.

**CINEMA Laboratory Values**

<table>
<thead>
<tr>
<th>Biomarker</th>
<th>Baseline</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb A1c</td>
<td>11.3%</td>
<td>6.0%</td>
</tr>
<tr>
<td>BMI</td>
<td>34 kg/m2</td>
<td>29 kg/m2</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>142/90 mmHg</td>
<td>119/73 mmHg</td>
</tr>
<tr>
<td>LDL-C</td>
<td>63 mg/dl</td>
<td>28 mg/dl</td>
</tr>
<tr>
<td>UACR</td>
<td>60 mg/g</td>
<td>31 mg/g</td>
</tr>
<tr>
<td>eGFR</td>
<td>59 ml/min/1.73m2</td>
<td>72 ml/min/1.73m2</td>
</tr>
<tr>
<td>LVEF</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>Fib 4 score (NAFLD)</td>
<td>1.72</td>
<td>1.48</td>
</tr>
</tbody>
</table>

3 Months
Targeted Interventions

• Lifestyle: Increased vegetables at meals and less pasta and bread, replace processed snack bars with nuts, started exercise 30 min/day.
• Added Synjardy
• Added Semaglutide
• Titrated off of glimepiride
• Changed Losartan to Candasartan and titrated from 32 mg qd to 8 mg qd.
• Targeted weight loss – he went from size 44 to 38 waist!
• Smoking cessation counseling – he quit smoking!
• CGM enrollment – able to learn and utilize CGM technology
Patient-Centered, Evidenced-Based, Harmonized Approach

- Heart Failure
- High Blood Pressure
- ASCVD
- CKD Screening
- Monitor UACR
- Coordinated and Affordable Care
- Social Determinants of Health
- Metabolic Dyslipidemia
- Elevated BMI
- Obesity
- Blood Glucose
- Insulin Monitoring
Common roles for CHWs in Cardiometabolic Care

**Clerical:** Outreach for appointments with reminder calls, confirmation of a means of transportation to the appointment, and general follow-up afterwards.

**Educational:** Providing key information Obesity and Type 2 Diabetes, such as chronic disease management, and recommended action steps.

**Clinical:** Providing guidance aimed at slowing the progress of metabolic diseases as long as these services are initiated by a licensed provider, e.g., taking vitals and reason(s) for a person being seen by the medical provider, health screenings, and interpreting medical terminology.

**Hospitals:** Assisting patients in their transition back to their homes and reducing the possibility of a re-admission to the hospital.

**Insurance Navigation:** Helping individuals and families enroll in health insurance and link to other health services and low-cost financial resources to pay for needed health services.

**Referral:** Connecting an individual and their family with available resources.
Using Technology

5G Hub
Key Features

- Connects to various third party medical devices
- Provides connectivity out of the box
- Built in cellular connectivity
- Upgrades automatically over the air
- Discrete size and profile

Hardware
Thank you for listening!
INTERDISCIPLINARY CLINICS

Controversies conference 22 March 2024 Vancouver
Debasish Banerjee - Research Grant - AstraZeneca, Speaker Fees – AstraZeneca, CSL Vifor, Advisory Board – Medice

Lisa Anderson - Research Grant - AstraZeneca, Pfizer, Speaker Fees - Alynan
How can we help HF patients with CKD

**Diagnoses:**
- Type 2 diabetes
- Ischaemic heart disease, LAD stenting
- Abdominal aortic aneurysm
- Carotid endarterectomy
- AKI due to cholesterol emboli
- MRI brain showing multiple infarcts
- Peripheral vascular disease
- Gout
- HFrEF 28% with global hypokinesia
- Chronic kidney disease stage IV, GFR 16

**Presentation:**
- 84-year-old male
- Lives with his wife
- Independent, walks his dog
- Wishes to stay at home and walk
- Pulse 62, BP 100/60
- No oedema

**Laboratory**
- Sodium 143
- Potassium 5.2
- eGFR 30
- Hb 114
- Ferritin 88

**Medications:**
- Clopidogrel 75 mg once a day
- Atorvastatin 80 mg once a day
- Sodium bicarbonate 500 mg TDS
- Frusemide 40 mg twice a day
- Isosorbide 10 mg twice a day
- Famotidine 20 mg once a day
- Vitamin D 1000 units once a day
- NovoMix 30 insulin twice a day
- Bisoprolol 3.75 mg once a day
- Dapagliflozin 10 mg once a day
- Sacubitril/Valsartan 97/103 mg BD
- Epleronone 50 mg OD
- IV iron

No hospital admission 2 years
Why do we need interdisciplinary care

• CKD is common in heart failure (50%)
• What are the issues with single specialty care?
• What are the barriers of CKD-HF care?
• What is the evidence for CKD-HF?
• What do the patients CKD-HF need?

• What do the patients expect?
UK: 48% HF in cardiology, St George’s 13% in cardiology

170 of 178 Trusts
£1.2m CQUIN for Dedicated HF Unit

- Agreed Sept 2013, for Delivery in 2014/15
- Senior and Junior Ward Manager
- Therapy team
- Pharmacy team
- Senior and Junior fellow
- Echo physiologist

- End of year – not progressed, money spent
Where was all the money going?....

St George’s becomes an NHS Foundation Trust

Published: 2 Feb 2015

Health regulator Monitor has approved St George’s as a Foundation Trust. To reflect this achievement, the Trust has changed its status to St George’s University Foundation Trust.

St George’s chief executive, Miles Scott, said:

“This is a great day for our staff, our patients and the communities we serve. Achieving Foundation Trust status...
The south London trust became an FT in February, on the basis that it would break even in 2014-15 and make a surplus in the current financial year. But by the time the trust’s board met later that month, it was already forecasting a £5.5m deficit, and things only got worse from there.

By the end of March it was £16.8m in the red. It is now planning for a deficit of up to £30m for 2015-16.
### Original Financial model based on 17 beds

<table>
<thead>
<tr>
<th>Description</th>
<th>Related Activity YEAR 1</th>
<th>Q4 2015/16</th>
<th>Comment</th>
<th>Related activity YEAR 2</th>
<th>2015/16 FY Value (£) updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved coding of heart failure patients to EB03H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase in cardiac diagnostic activity from new consultant (echos)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase in outpatient activity from new consultant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient Activity already in the baseline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCG Funding</td>
<td>250,000</td>
<td>CCG funding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced fines for readmissions (5% reduction, 12.3% fine)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total income</strong></td>
<td>250,000</td>
<td></td>
<td></td>
<td></td>
<td>1,087,206</td>
</tr>
<tr>
<td><strong>Total pay costs</strong></td>
<td>19</td>
<td>179,364</td>
<td>Q4 costs of staffing</td>
<td>19</td>
<td>942,685</td>
</tr>
<tr>
<td>Total pay costs already in budget</td>
<td>19</td>
<td>179,364</td>
<td>Q4 costs of staffing</td>
<td>19</td>
<td>942,685</td>
</tr>
<tr>
<td>Total direct non-pay costs</td>
<td>19</td>
<td>179,364</td>
<td>Q4 costs of staffing</td>
<td>19</td>
<td>942,685</td>
</tr>
<tr>
<td>Total indirect pay costs (overhead costs)</td>
<td>19</td>
<td>179,364</td>
<td>Q4 costs of staffing</td>
<td>19</td>
<td>942,685</td>
</tr>
<tr>
<td>Total capital</td>
<td>42,826</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total expenditure</strong></td>
<td>250,222</td>
<td></td>
<td></td>
<td></td>
<td>1,042,503</td>
</tr>
</tbody>
</table>

**5 year NPV (3.5% DCF)**

**Potential balance if income and efficiencies achieved**

**Commissioners funding**

Further £250K invested by Wandsworth CCG July 2015

3m business case approved July 2015
Message to all staff

Appointment of turnaround director and turnaround support from KPMG
No progress...

Contract Performance Notice Issued Sept 2015

NHS Standard Contract 2015/16
General Conditions Draft for consultation December 2014
Progress......

Staffing HR1s signed off Dec 2015
PFI building work began Jan 11th 2016
HFU opened Feb 20th 2016
Conditions of approval (and commitments from the service) were to disinvest if financial benefits were not delivered. Based on this, resources should be removed as the service is unable to provide the return on investment necessary to pay for the higher level of care provided. The Trust must however consider that the quality of care may deteriorate, with a risk of increased mortality if patients are not treated in an appropriate manner.

Assistance needed.......renal input for diuretic resistant patients
First Paper: Under-treatment of HF with CKD

Figure 1 Use of medications with different stages of chronic kidney disease in patients with left ventricular systolic dysfunction. ACE, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; CKD, chronic kidney disease; MRA, mineralocorticoid receptor antagonist. No-mild CKD, no CKD or CKD Stages 1–2; moderate CKD, CKD Stages 3a–3b; severe CKD, CKD Stages 4–5.
AKI as a dominant risk factor in AHF

**Table 1** Frequency and in-hospital mortality by chronic kidney disease stage (all admissions)

<table>
<thead>
<tr>
<th>CKD stage</th>
<th>Number (% of total admissions)</th>
<th>Death in hospital (%)</th>
<th>Age in years (mean and SD)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 or 1</td>
<td>261 (24.72)</td>
<td>20/261 (7.66)</td>
<td>70.69 (15.57)</td>
</tr>
<tr>
<td>2</td>
<td>295 (27.94)</td>
<td>23/295 (7.80)</td>
<td>66.63 (12.08)</td>
</tr>
<tr>
<td>3a</td>
<td>193 (18.28)</td>
<td>21/193 (10.88)</td>
<td>76.79 (11.03)</td>
</tr>
<tr>
<td>3b</td>
<td>191 (18.09)</td>
<td>16/191 (8.38)</td>
<td>79.66 (9.20)</td>
</tr>
<tr>
<td>4</td>
<td>94 (8.90)</td>
<td>14/94 (14.89)</td>
<td>79.55 (10.87)</td>
</tr>
<tr>
<td>5</td>
<td>22 (2.08)</td>
<td>2/22 (9.09)</td>
<td>72.77 (16.12)</td>
</tr>
</tbody>
</table>

**Table 4** Incidence and in-hospital mortality of stages of acute kidney injury in all admissions

<table>
<thead>
<tr>
<th>Stage of AKI</th>
<th>Frequency (%)</th>
<th>Mortality P &lt; 0.001</th>
</tr>
</thead>
<tbody>
<tr>
<td>No AKI</td>
<td>876 (83.0)</td>
<td>44/876 (5.0%)</td>
</tr>
<tr>
<td>1</td>
<td>110 (10.4)</td>
<td>23/110 (20.9%)</td>
</tr>
<tr>
<td>2</td>
<td>39 (3.7)</td>
<td>14/39 (35.9%)</td>
</tr>
<tr>
<td>3</td>
<td>31 (2.9)</td>
<td>15/31 (48.4%)</td>
</tr>
</tbody>
</table>

AKI, acute kidney injury.
CKD-HF risk: GFR OR albuminuria OR both

<table>
<thead>
<tr>
<th>Kidney function</th>
<th>Hospitalisation/100 person year</th>
</tr>
</thead>
<tbody>
<tr>
<td>eGFR 45-70</td>
<td>3.1 [2.5-3.7]</td>
</tr>
<tr>
<td>eGFR 30-44</td>
<td>7.4 [6.2-8.6]</td>
</tr>
<tr>
<td>eGFR &lt;30</td>
<td>10.3 [5.4-12.2]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Urine albumin</th>
<th>Hospitalisation/100 person year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine ACR</td>
<td></td>
</tr>
<tr>
<td>&lt;30</td>
<td>2.9 [2.3-3.5]</td>
</tr>
<tr>
<td>30-300</td>
<td>6.6 [5.3-8.0]</td>
</tr>
<tr>
<td>&gt;300</td>
<td>9.7 [8.3-11.2]</td>
</tr>
</tbody>
</table>

3791 patients eGFR 20-70, 2003-08 followed till 2014 1774 HHF risk, other risk factors were age, men, black, DM, HTN, IHD, AF
# CKD-HF Risk reduction with SGLT2i by KDIGO risk

<table>
<thead>
<tr>
<th>KDIGO RISK</th>
<th>GFR and Albuminuria</th>
<th>HR [95CI]</th>
<th>Event rate /100py</th>
<th>Absolute RR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low 32%</td>
<td>GFR&gt;60 ACR&lt;30</td>
<td>0.81 [0.66-1.01]</td>
<td>6.78</td>
<td>-1.26</td>
</tr>
<tr>
<td>Moderate 29%</td>
<td>GFR&gt;60 ACR30-300</td>
<td>0.63 [0.52-0.76]</td>
<td>11.30</td>
<td>-4.03</td>
</tr>
<tr>
<td>High 22%</td>
<td>GFR&gt;60 ACR &gt;300</td>
<td>0.82 [0.68-0.98]</td>
<td>15.15</td>
<td>-3.27</td>
</tr>
<tr>
<td>Very High 17%</td>
<td>GFR&lt;30 ACR&lt;30</td>
<td>0.84 [0.71-1.01]</td>
<td>20.70</td>
<td>-2.84</td>
</tr>
</tbody>
</table>

9714 HF patients pooled from EMPEROR reduced and EMPEROR preserved

34% with CKD and HF are on SGLT2i in UK - Forbes 2024

Butler JACC 2023 81 1902
### Evidence for HF therapy from RCT: CKD and no-CKD

<table>
<thead>
<tr>
<th>Trial</th>
<th>Exclusion</th>
<th>&lt;60 ml/min/1.73m²</th>
<th>&gt;60 ml/min/1.73 m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAPA -HF</td>
<td>eGFR&lt;30</td>
<td>0.72 [0.66-0.86]</td>
<td>0.76 [0.63-0.92]</td>
</tr>
<tr>
<td>DELIVER</td>
<td>eGFR&lt;25</td>
<td><strong>0.81 [0.69-0.94]</strong></td>
<td>0.84 [0.70-1.00]</td>
</tr>
<tr>
<td>EMPEROR-P</td>
<td>eGFR&lt;20</td>
<td>0.78 [0.66-0.91]</td>
<td>0.81 [0.66-1.00]</td>
</tr>
<tr>
<td>EMPEROR-R</td>
<td>eGFR&lt;20</td>
<td>0.83 [0.69-1.00]</td>
<td>0.67 [0.55-0.83]</td>
</tr>
<tr>
<td>SOLOIST-HF</td>
<td>eGFR&lt;30</td>
<td><strong>0.59 [0.44-0.79]</strong></td>
<td>0.90 [0.58-1.37]</td>
</tr>
<tr>
<td>PIONEER-HF</td>
<td>eGFR&lt;30</td>
<td>0.73 [0.61-0.87]</td>
<td>0.70 [0.59-0.84]</td>
</tr>
<tr>
<td>PARAGON-HF</td>
<td>eGFR&lt;30</td>
<td>0.79 [0.66-0.95]</td>
<td>1.01 [0.80-1.27]</td>
</tr>
<tr>
<td>GALACTIC-HF</td>
<td>eGFR&lt;20</td>
<td>0.98 [0.89-1.07]</td>
<td>0.84 [0.75-0.94]</td>
</tr>
<tr>
<td>PARADIGM-HF</td>
<td>eGFR&lt;30</td>
<td>similar</td>
<td>similar</td>
</tr>
<tr>
<td>EMPHASIS</td>
<td>eGFR&lt;30</td>
<td>similar</td>
<td>similar</td>
</tr>
</tbody>
</table>
Quality of guideline therapy in CKD patients with chronic HFrEF

<table>
<thead>
<tr>
<th></th>
<th>&gt;60 [17032]</th>
<th>45-59 [6967]</th>
<th>30-44 [5363]</th>
<th>&lt;30 [2306]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prescription</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta Blocker</td>
<td>94</td>
<td>93</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>ACEi/ARB/ARNi</td>
<td>96</td>
<td>92</td>
<td>86</td>
<td>68</td>
</tr>
<tr>
<td>MRA</td>
<td>45</td>
<td>44</td>
<td>37</td>
<td>24</td>
</tr>
<tr>
<td>Triple therapy</td>
<td>38</td>
<td>35</td>
<td>28</td>
<td>15</td>
</tr>
<tr>
<td><strong>Initiation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta Blocker</td>
<td>75</td>
<td>73</td>
<td>73</td>
<td>74</td>
</tr>
<tr>
<td>ACEi/ARB/ARNi</td>
<td>89</td>
<td>84</td>
<td>77</td>
<td>61</td>
</tr>
<tr>
<td>MRA</td>
<td>41</td>
<td>39</td>
<td>31</td>
<td>20</td>
</tr>
<tr>
<td>Triple therapy</td>
<td>29</td>
<td>25</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>74 [65-81]</td>
<td>69 [60-76]</td>
<td>80 [74-85]</td>
<td>80 [73-85]</td>
</tr>
</tbody>
</table>

31,668 HF patients age 74 [68-81], DM 28%, AF 55%, IHD 57%, Swedish HF registry
The FRAIL study: Investigating the relationship between Frailty And Quality of Life in patients with heart failure & CKD

Results:

103 CKD-HF, frailty rate was 49%
Frailty was associated with polypharmacy
Frail patients had reduced QoL scores
Priority was ‘Better quality of life’, rather than longer survival

Recommendations:

Clinicians to prioritise the prompt recognition and intervention in frailty
Future research to focus on interventions for reducing frailty in patients with CKD-HF
Future RCT’s in this cohort to routinely incorporate frailty as outcome measures
### Benefits of therapy in Frail CKD-HF patients

<table>
<thead>
<tr>
<th></th>
<th>Not Frail</th>
<th>Frail</th>
<th>Most Frail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>70.1 [10.3]</td>
<td>72.6 [9.0]</td>
<td>72.7 [8.8]*</td>
</tr>
<tr>
<td>EF</td>
<td>54.2 [9.1]</td>
<td>54.2 [8.8]</td>
<td>54.1 [8.3]</td>
</tr>
<tr>
<td>eGFR mean</td>
<td>68.7 [18]</td>
<td>59.1 [18.3]</td>
<td>52.1 [17.4]*</td>
</tr>
<tr>
<td>&lt;60 ml/min</td>
<td>29.6</td>
<td>53.9</td>
<td>71.8*</td>
</tr>
<tr>
<td>&gt;60 ml/min</td>
<td>70.4</td>
<td>46.1</td>
<td>28.2</td>
</tr>
<tr>
<td>CV death WHF with Dapagliflozin [RR]</td>
<td>0.85 [0.68-1.06]</td>
<td>0.89 [0.74-1.08]</td>
<td>0.74 [0.61-0.91]</td>
</tr>
</tbody>
</table>

6258 patients from DELIVER study  
Frail patients, older with more CKD benefits with SGLT2i
### Hyperkalaemia as a barrier in CKD-HF therapy

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>eGFR 45-59 N=71347</th>
<th>30-44 28020</th>
<th>15-39 3363</th>
<th>&lt;15 1305</th>
<th>Dialysis 1762</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart failure</td>
<td>88.2</td>
<td>85.9</td>
<td>80.7</td>
<td>66.5</td>
<td>40.7</td>
</tr>
<tr>
<td>Hyperkalaemia</td>
<td>12.1</td>
<td>14.9</td>
<td>19.2</td>
<td>31.8</td>
<td>48.8</td>
</tr>
<tr>
<td>Volume overload</td>
<td>0.6</td>
<td>0.5</td>
<td>1.8</td>
<td>4.9</td>
<td>16.8</td>
</tr>
<tr>
<td>Malignant HTN</td>
<td>0.4</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
<td>0.3</td>
</tr>
</tbody>
</table>

17,176 visits in 111,087 CKD patients
667 total admissions (min 0, median 1, mean 2.1, max 14)

201 heart failure admissions (min 0, median 0, mean 0.6, max 13)

227 (71.4%) had at least one hospital admission for any reason
110 (34.6%) had at least one hospital admission for worsening HF

318 patients 443 person-year follow up

HFrEF compared to HFpEF (IRR 1.29, 95% CI 1.07, 1.55) and diuretic use (IRR 1.25, 95% CI 1.03, 1.52) were associated with more admissions
Higher eGFR (IRR 0.99, 95% CI 0.98, 0.99) and ACEi/ARB use (IRR 0.55, 95% CI 0.46, 0.65) were associated with fewer hospital admissions
CKD-HF patient care; who provides? expectations?

Patient at the centre of care with their own priorities
Objectives of interdisciplinary care

- Coordinated, Comprehensive approach
  - Personalised, Optimum care
  - Less variability, Faster pace of care

GDMT, Diuretics, IV Iron, Education

Less mortality, hospitalisation and cost; Better QOL
**Interdisciplinary clinic protocols**

<table>
<thead>
<tr>
<th>Referral criterion</th>
<th>Plan of management</th>
</tr>
</thead>
<tbody>
<tr>
<td>eGFR&lt;30 ml/min/1.73m2</td>
<td>Control symptoms of breathlessness, oedema, tiredness</td>
</tr>
<tr>
<td>OR eGFR 30-60 with uACR&gt;30 mg/mmol, OR eGFR 30-60 and declining eGFR excluding AKI</td>
<td>Achieve decongestion with minimal oedema, clear chest, normal JVP, target weight, use loop diuretic ± metolazone</td>
</tr>
<tr>
<td>Potassium &gt;5.4 mmol/L due to RAASi</td>
<td>Maximise ARNI/ACEi/ARB in HF eg Entresto 24/26 to 49/51, 97/103 mg BD</td>
</tr>
<tr>
<td>May need dialysis or renal transplantation</td>
<td>Maximise β-blocker bisoprolol 10 mg aim pulse&lt;65bpm in sinus, 70-80bpm in AF</td>
</tr>
<tr>
<td>Needs RAASi maximisation</td>
<td>Maximise MRA e.g. eplerenone 12.5 to 50 mg OD start if potassium &lt;5.0</td>
</tr>
<tr>
<td>Refractory congestion despite two diuretics</td>
<td>Dopagliflozin/empagliflozin 10 mg OD</td>
</tr>
<tr>
<td></td>
<td>Intravenous iron if ferritin &lt;200, [&lt;300 with TSAT&lt;20%] Hb &lt;140</td>
</tr>
<tr>
<td></td>
<td>Finerenone in DKD 10mg to 20mg OD, start if potassium &lt;5.0</td>
</tr>
<tr>
<td></td>
<td>Anticoagulation of AF apixaban 2.5 mg BD if eGFR&gt;15</td>
</tr>
<tr>
<td></td>
<td>Consider semaglutide if BMI&gt;30 Wegovy 0.25 to 2.4 mg sc weekly</td>
</tr>
<tr>
<td></td>
<td>Control hypertension BP&lt;140/90 (ideally lower)</td>
</tr>
<tr>
<td></td>
<td>Six monthly eGFR, uACR, yearly echo after 3-6 months on GDMT to monitor improvement prior to discharge, then to be implemented in primary care</td>
</tr>
</tbody>
</table>

**What needs monitoring**
- Symptoms: breathlessness, oedema, tiredness, urinary symptoms; QOL
- Signs BP, Pulse, Chest clear, Oedema minimal Weight ±2 kg of target weight, BMI<27.5
- Laboratory: eGFR, uACR, Na, K, Haemoglobin >100, Ferritin, TSAT, NT-proBNP

**Who can be transferred back to primary care**
- Established cause of CKD and HF and Clinically stable with
- Maximally tolerated ARNI/ACEi/ARB, SGLT2i and beta blocker with HR and BP control
- Ferritin>200, Tsat >20%, Hb>100
- Decongested, close to target weight with minimal oedema
- Long term cardiac and renal plan agreed (Need for CRT/ICD, transplant, dialysis, anticoagulation)
Benefits of interdisciplinary care at St George’s

First Visit
124 patients

234 days

Last Visit
97 patients

<table>
<thead>
<tr>
<th></th>
<th>FIRST VISIT</th>
<th>LAST VISIT</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual RAASi</td>
<td>13%</td>
<td>20%</td>
<td>0.03</td>
</tr>
<tr>
<td>Iron deficiency</td>
<td>57%</td>
<td>27%</td>
<td>0.002</td>
</tr>
<tr>
<td>Ferritin</td>
<td>67</td>
<td>185</td>
<td>0.001</td>
</tr>
<tr>
<td>Haemoglobin</td>
<td>86</td>
<td>101</td>
<td>0.100</td>
</tr>
</tbody>
</table>
RAASi maximisation in CKD-HF

Baseline: eGFR<60, HFrEF, Age >18y, K 5.0-5.5mmol/L, SBP >90 mm Hg, Not on maximum ACEi/ARB/MRA (e.g. Ramipril <10 mg/d, Spironolactone <50 mg/d)

Randomisation (n=116) after QOL (EQ 5D 3L) survey

Lokelma
10g TDS 48h
5 or 10g/day

Placebo
10g TDS 48h
5 or 10g/day

Primary outcome: Reaching at least half dose of ACEi/ARB and MRA & K<5.5
QOL score, eGFR, K', cardiac biomarkers, recruitment, retention etc

104 patients randomised with interdisciplinary study

Murphy BMC Neph 2021 22 254
At-home management of fluid overload

### Managing fluid overload with subcutaneous furosemide – collaboration cardiologist nephrologist hospital-at-home team

<table>
<thead>
<tr>
<th>Age</th>
<th>Ethnicity</th>
<th>Gender</th>
<th>LVEF (%)</th>
<th>Baseline eGFR (ml/min/1.73²)</th>
<th>Baseline oral loop diuretic dose (mg)*</th>
<th>Baseline K (mmol/L)</th>
<th>End eGFR (ml/min/1.73²)</th>
<th>End K (mmol/L)</th>
<th>Weight change (kg)</th>
<th>Received oral K+</th>
<th>A/E during 5-day period</th>
<th>Admission during 5-day period</th>
<th>30-day hospital admission</th>
<th>30-day mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>84</td>
<td>Male</td>
<td>50</td>
<td>25</td>
<td>200</td>
<td>4.7</td>
<td>27</td>
<td>3.9</td>
<td>-4.4</td>
<td>0</td>
<td>1&quot;</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>Other</td>
<td>Male</td>
<td>39</td>
<td>49</td>
<td>4.9</td>
<td>62</td>
<td>3.1</td>
<td>-8.2</td>
<td>1</td>
<td>1&quot;&quot;</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>86</td>
<td>Mixed</td>
<td>Male</td>
<td>35</td>
<td>49</td>
<td>4.3</td>
<td>37</td>
<td>4.8</td>
<td>-0.6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>89</td>
<td>Other</td>
<td>Female</td>
<td>55</td>
<td>20</td>
<td>4.6</td>
<td>23</td>
<td>3.5</td>
<td>-1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>85</td>
<td>Other</td>
<td>Male</td>
<td>40</td>
<td>20</td>
<td>3.4</td>
<td>18</td>
<td>4.2</td>
<td>1.8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>73</td>
<td>Black or Black British</td>
<td>Female</td>
<td>30</td>
<td>120</td>
<td>4.2</td>
<td>18</td>
<td>4.1</td>
<td>-4.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>78</td>
<td>Black or Black British</td>
<td>Male</td>
<td>50</td>
<td>35</td>
<td>4.8</td>
<td>34</td>
<td>4.1</td>
<td>-0.6</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>88</td>
<td>Other</td>
<td>Female</td>
<td>25</td>
<td>48</td>
<td>4.4</td>
<td>42</td>
<td>4.1</td>
<td>-0.6</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>73</td>
<td>White British</td>
<td>Female</td>
<td>60</td>
<td>13</td>
<td>4.3</td>
<td>15</td>
<td>4.1</td>
<td>0.2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
New Project: CRM Clinic

Renal demand growth (baseline 2020)
Forecast – Extra ICHD patients by 2030

London
779
(Low Scenario)

London
1,923
(High Scenario)

London
1,358

£6.6m annual increase
£35m cum 10-year cost

£2.9m annual increase
£16m cum 10-year cost

£5.5m annual increase
£29m cum 10-year cost

£8.1m annual increase
£43m cum 10-year cost

£8.5m annual increase
£45m cum 10-year cost

£31.5m annual increase
£167m cum 10-year cost

Note: Geographic splits for Patients cared for by London Renal Centres so will include some out of area patients e.g. SWL includes Surrey/Heartlands patients.
1. Preventing onset

Optimise the prevention, detection and management of CKD in the community

2. Preventing progression

a) Integrated cardio-renal-metabolic MDT approach for multi-comorbid patients
b) Supportive Care
c) Discharge planning for complex patients

3. Preventing deterioration

People and community engagement, activation and empowerment

4. Managing end of life
Patient identification
Patients with chronic kidney disease, diabetes are at highest risk for hospital admission with heart failure.

Management plan
The personalised management plan will be designed by a MDT team including a cardiologist, nephrologist, diabetologist, pharmacist and primary care physician. The management plan will include SGLT2i inhibitors, beta blockers, ACEi/ARB, mineralocorticoid receptor antagonist, intravenous iron together with plan for hypertension and diabetes control as per NICE guidance.

Once the management plan is set the implementation will involve a pharmacist and a nurse in the community with regular blood pressure monitoring and weight monitoring.

Management plan for fluid overload:
If the patient's weight increases >5 kg over 1-4 weeks – they will be offered home treatment with subcutaneous furosemide, another pilot project initiated by SW London Innovations Fund to prevent hospital admission.

Outcomes/impact:
- % increase in the number of patients with max RAASI
- % increase in the number of patients on RAASI and SGLT2i
- Documented care plan, including ACP where appropriate
- Reduction in hospital admissions
- Reduction in progression to end stage renal disease
- Improved patient experience
- Reduced outpatient attendances
- Reduced ED attendances
- Improved collaboration between specialties and 1/2 care

Proposal:
- 1 PA weekly Cardiologist
- 1 PA weekly Diabetologist
- 1 PA weekly Nephrologist
- 1 PA weekly Geriatrician
- 1 PA weekly GP
- Pharmacy supervisor 0.2 WTE Band 7/8
- Nurse 0.5 WTE Band 7
- 0.4 WTE admin B5
Thank you for listening..