Digital Technology in Maternity Healthcare – an update

Messaging Enabled Care Services (MECS) using the “Florence” SMS Texting System

- an NE&NC AHSN-funded Collaborative Maternity Innovation Project

Kim Hinshaw Raz Nayar Janette Johnson
Patients told to go online in radical NHS reform

Kat Lay
Last updated at 12:01AM, November 13 2014

Patients will be able to view test results and book appointments online under “radical” plans to make accessing the NHS as simple as online banking. An official report yesterday set out how patients would be able to view their health records online by 2018 in an effort to make the health service a “digital pioneer”. Doctors

Selfie from space says Philae is safe

Briton jailed by Iran over Fifa investigator
Home management in mild PIH

**Kim Hinshaw**
City Hospitals Sunderland NHS Foundation Trust
MB BS, FRCOG
Clinical Lead /Consultant Obstetrician
NHS England TECS - Clinical Advocate 2014 Winner

Email: kim.hinshaw@lineone.net

Gestational Diabetes & Telehealth

**Rahul Nayar**
City Hospitals Sunderland NHS Foundation Trust
MD, FRCP.
Clinical Lead, Consultant Physician in Diabetes & Endocrinology
NHS England TECS - Clinical Advocate 2014 Winner

Email: Rahul.nayar@chsft.nhs.uk

http://chsft.nhs.uk
The Multi Matrix Telehealth Model

- Optimum Health
- Robust Health
- Good Health
- Average Health
- Signs of Illness
- Chronic Illness
- Irreversible Illness
- Premature Death
- Whole Life Perspective
- Conception
- Death
Pregnancy-induced hypertension (PIH)

- ‘Mild PIH’ affects 5-10% of pregnant women
- 2-3% of pregnant women develop ‘pre-eclampsia’
- However, ‘severe pre-eclampsia’ only affects 0.5% (1/200)
- ‘Mild PIH’ contributes a significant workload to NHS:
  - referred for ANTEnatal DAY UNIT assessment
  - subsequently, multiple home visits by COMMUNITY MIDWIFE
  - further visits to MEDICAL HOSPITAL ANTEnatal CLINIC
Developed Multi Partner Teams

PIH Hospital Team

GDM Hospital Team

....fully supported by NHS Northern Senate Telehealth team
• Clinical team developed safe inclusion/exclusion criteria

• Telehealth team developed the ‘Florence’ text system for the project:
  – texting information ‘to & from’ patient
  – appropriate ‘patient alerts’
  – procured necessary monitoring equipment
  – facilitated provision of patient information sheets (PIS)

MECS - home monitoring in mild pregnancy-induced hypertension (PIH)
Clarified mild PIH pathways

**Inclusion criteria:**
- 28 to 38 weeks pregnant
- no symptoms (e.g., headache, flashing lights, etc)
- normal blood results
- proteinuria

**Exclusion criteria:**
- symptomatic or BP raised (see table):

<table>
<thead>
<tr>
<th>Level of Proteinuria</th>
<th>Systolic</th>
<th>Diastolic</th>
<th>Upper limit for inclusion to Telehealth</th>
</tr>
</thead>
<tbody>
<tr>
<td>No proteinuria</td>
<td>140-150</td>
<td>90-100</td>
<td>149/99 with no protein</td>
</tr>
<tr>
<td>+ proteinuria</td>
<td>&lt;146</td>
<td>&lt;96</td>
<td>145/95 with + protein</td>
</tr>
<tr>
<td>++/+++ proteinuria</td>
<td>&lt;140</td>
<td>&lt;90</td>
<td>139/89 with ++/+++ protein</td>
</tr>
</tbody>
</table>

All women who develop any symptoms will be informed by Florence text to: contact ANDU or Delivery suite the same day for 1:1 discussion and management irrespective of BP and urine measurement.
MECS -home monitoring in mild pregnancy-induced hypertension (PIH)

Only requires simple, cheap equipment

Microlife ‘WatchBPhome’
digital BP Monitor

- Cheap (~ £60)
- Portable
- Easy to use
- Validated for pregnancy

Meditest ‘Protein2’
urine dipstix ( £3.25)
(supplied by BHR Pharmaceuticals Ltd)
www.bhr.co.uk
Suitable women registered on ‘Florence’ SMS text system

BP/urine monitoring on days 2/4/6

Uneventful monitoring

• Review in ANTENATAL DAY UNIT on day 7 & EQUIPMENT RETURN
• Further management decided at review

Develops symptoms / ↑BP or proteinuria (above protocol set levels)

• Appropriate SMS alert to patient & unit notified
• Review on unit / Labour ward
Hi, your protein and blood pressure are fine today - we will contact you when it's time to send in your next readings. Take care, Flo.

28th May 2013 12:31

P0 bp 110 88

28th May 2013 12:30

Please text in your Protein & Blood Pressure readings this morning, before 1pm. For example "P2BP 139 95". Thanks Flo

28th May 2013 12:30

Hy2

28th May 2013 12:29

Are you experiencing severe headache, flashing lights or severe pain at top of tummy or under ribs on the right? Reply HY1 for YES, HY2 for NO. Thanks Flo.
Patient
Control & Opinion

Level of Control Before Telehealth

- Not at all in control: 23%
- A little bit in control: 18%
- In control - enough for me: 36%
- Completely in control: 13%

Level of Control After Telehealth

- Not at all in control: 0%
- A little bit in control: 23%
- In control - enough for me: 0%
- Completely in control: 63%

Patients Opinion of the Florence System

- Poor: 0%
- Reasonable: 32%
- Good: 68%
- Excellent: 0%
Compared to previous experience

Experience of Current and previous Pregnancy

- Much better than last time: 100%
- Better than last time
- About the same as last time
- Not quite as good as last time
- Definitely not as good last time
MECS - PIH – Patient feedback

“Easier with other children at home”
“Fitted around lifestyle and routine”
“Didn’t have to attend day unit as much”
“Excellent system for independent people”
“Very quick response to my results, it’s a clever system”
“Saves time for midwives to deal with other things”

<table>
<thead>
<tr>
<th>Verbal/written information</th>
<th>100% ‘Just right’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty in using system?</td>
<td>100% NO</td>
</tr>
<tr>
<td>Did you feel it was safe?</td>
<td>100% YES</td>
</tr>
</tbody>
</table>
MECS - PIH Cost savings

- **Community Midwife** - £60 per home visit (usually x2 visits per week)
  
  \[n=100 \text{ women for 1 week} = \mathbf{£12,000}\]

- **Day unit attendance** - potential saving £180 per visit
  
  \[n=100 \text{ women x2 visits saved} = \mathbf{£36,000}\]

**Additional cost savings**

- Reduced mileage costs for community midwives - rural community services
- Reduced carbon footprint for Trust / individual people
- Reduced travel costs for women attending day unit / clinic
**Gestational Diabetes Mellitus (GDM)**

- **Definition:**
  First presentation of high blood glucose levels in pregnancy.

- **When?**
  Detected between 24 – 28 weeks but can be earlier.

- **How?**
  Fasting glucose level > 5.6mmol/l or Oral Glucose Tolerance Test Fasting > 5.6mmol/l or 2hr > 7.8mmol/l

- **Risk factor screening – previous GDM – test earlier**

- **Common condition (~5%) – with changes in diagnostic criteria & obesity prevalence set to increase**
Gestational Diabetes (GDM)

• GDM—defined by NICE criteria
• Simple Mobile phone technology linked to Diabetes care
• via SMS
• Short (~12 wks) Intervention Process for pre-defined condition

**Telehealth offers:**

• *Flexible, Convenient & Safe method for Blood glucose monitoring*
• *Weight management & lifestyle change adherence*
• *Medication titration (insulin) during pregnancy*
• **Average recruitment:** 6 new patients per month.

• **Mean duration** of ‘Simple Telehealth’ use was 12 weeks (range 6 – 22).

• **Patient Treatment:**
  - **Up titration of medication occurred via SMS** & at clinic
  - 35% Diet only,
  - 40% Diet + Metformin,
  - 25% Diet + Metformin + Insulin
**MECS – GDM Outcomes**

**DTSQ results**

- high levels of *satisfaction, convenience & flexibility* with treatment
- enhanced *understanding* of diabetes with all patients.

<table>
<thead>
<tr>
<th>Very satisfied</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>Very dissatisfied</th>
<th>Average Satisfaction Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: How satisfied are you with your current treatment?</td>
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<td>6</td>
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<td>2: How often have you felt that your blood sugars have been unacceptably high recently?</td>
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<td>1.3</td>
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<tr>
<td>3: How often have you felt that your blood sugars have been unacceptably low recently?</td>
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<td>0.7</td>
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<tr>
<td>4: How convenient have you been finding your treatment to be recently?</td>
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<td></td>
<td></td>
<td>5.9</td>
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<tr>
<td>5: How flexible have you been finding your treatment to be recently?</td>
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<td>5.8</td>
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<tr>
<td>6: How satisfied are you with your understanding of your diabetes?</td>
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<td>5.2</td>
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<tr>
<td>7: Would you recommend this form of treatment to someone else with your kind of diabetes?</td>
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<td>6</td>
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<tr>
<td>8: How satisfied would you be to continue with your present form treatment?</td>
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<td>6</td>
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</tbody>
</table>
MECS – GDM
Safety & Economic Outcome

- There were **no adverse events/outcomes** reported during the pilot to mother or baby.

**Estimated cost savings:**
- 80 patients ~ **£20,000 / year** (hospital costs)
MECS in pregnancy - moving forwards....

The NE & North Cumbria
Academic Health Sciences Network
- MECS Project 2014
• Implementation of Telehealth monitoring in pregnancy in three hospitals in South Tyneside:
  o Queen Elizabeth Hospital
  o Sunderland Royal
  o South Tyneside

• Includes both ‘mild PIH’ and ‘GDM’

• Working with University of Sunderland (Prof Scott Wilkes & Jon Rees) & NHS Northern Senate (Paul Marriott, Jackie Smart, Rachael Forbister, Liz Allan)

• Health Economist – economic evaluation, patient & staff evaluation (satisfaction, locus of control etc)
Achievements

• Embedded in three units (QEH, CHS, S Tyne)
• Implemented 1 Sept 2015
• Decision trees to get denominator data
• Patient questionnaires
  – Satisfaction with ‘Florence’
  – Locus of control
  – Health economics
PIH TELEHEALTH DECISION TREE - Nov 14
(complete for ALL women referred for BPS)

AFTER BP SURVEILLANCE IS COMPLETE:
Does your patient fulfill ALL of the following criteria?
- Singleton pregnancy
- 20° - 37° weeks (Record: ___ wks ___ days)
- 18 - 39 years (Record: ___ yrs)
- No significant headaches, flashing lights etc
- BP appropriate for telehealth (see table in protocol)

YES NO

Does your patient have ANY of the following?
- Pre-existing Diabetes
- Renal disease
- Multiple pregnancy
- Abnormal BPS blood results
- Pre-eclampsia confirmed by urinary P-Cr

Ineligible for Telehealth
Agree plan of care – discuss with medical staff if necessary
(Women ≥38+0 wks with PIH or pre-
eclampsia should be considered for induction of labour – D/W medical staff)

NOW COMPLETE SECTIONS B1 & B2 ON NEXT PAGE & FILE DECISION TREE IN TELEHEALTH FOLDER

YOUR PATIENT IS ELIGIBLE FOR TELEHEALTH HOME BP & PROTEINURIA MONITORING
- After surveillance, you have found your patient has mild PIH or a normal blood pressure.
- In either case, if you would previously have considered arranging a CMW Visit or a further return to Day Unit to perform BP/Urine check, please put into telehealth monitoring instead.

Telehealth monitoring planned? Y ☐ N ☐
If NO - please give specific reason why not (eg patient declines [& why they decline], admitted, no mobile phone, language issues etc)

If YES - please complete the following:
- Complete submission protocol at www.florence.uk.net
- Give both patient leaflets (Telehealth & Simple Steps)
- Demonstrate how to take BP and use Urine Dipstrip
- Remind patient of importance of responding promptly to any alert from ‘Florence’
- Arrange follow up appointment in ANDU (for review, equipment return, questionnaire)
- If this is the second episode of BP surveillance – also arrange consultant clinic review

GO TO NEXT PAGE – PLEASE COMPLETE SECTIONS B1 & B2
**Patient Feedback**

Staff to add Hospital No: ________________________________

Date completed: __/__/____

**Managing High Blood Pressure in pregnancy – the 'Florence System'**

The team looking after you would like to provide the best possible care for you. We’re asking women who have used Florence to monitor their blood pressure, to complete this short anonymous questionnaire (... this means the person who looks at all the answers for you, will not know that it was you who answered the questions).

Thanks very much for taking the time to answer the questions – it will only take about 10 minutes to finish & will help us to make improvements or address any concerns you may have.

1. Hospital Unit (tick one):
   - Friarage, Northallerton
   - James Cook, Middlesbrough
   - Queen Elizabeth, Gateshead
   - South Tyneside
   - Sunderland

2. How old are you? _______ years old

3. Is this your first baby? Yes ☐ No ☐

4. For how many weeks did you use Florence for your blood pressure? ______ week(s)

5. If you have young children do you usually have to bring them to the hospital with you? Yes ☐ No ☐ Doesn’t apply ☐

6. About how many miles do you live from the hospital?
   - Less than 1 mile away
   - 1 to 5 miles
   - 5 to 10 miles
   - More than 10 miles

7. How do you usually get to hospital? (Tick one)
   - Walk
   - Bus/Train/Metro (I claim fare back)
   - Bus/Train/Metro (I don’t claim fare back)
   - Car (no parking fee to pay at the hospital)
   - Car (pay parking fee & claim it back)
   - Car (pay but don’t claim parking fee back)
   - Taxi (pay & claim fare back)
   - Taxi (pay but don’t claim fare back)

8. When you come to hospital for a check, about how long are you away from home or work?
   - Less than 1 hour
   - Between 1 to 2 hours
   - Between 2 to 4 hours
   - 4 hours or more

9. Were you working when you were using Florence? Yes ☐ No ☐

10. a) If YES – what is your job? ________________________________

    b) If you had needed more blood pressure checks at hospital or had needed to wait at home for your midwife to visit – would you have missed any time at work?

      Yes ☐ No ☐

11. About how much does it cost you to get to the hospital for a visit?

    - Taxi / bus / metro fares
    - Car parking
    - Child care
    - Anything else? Write here: £

**These next questions are about what you think about the 'Florence' system**

- Please tick one box for each statement

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I was given enough information before I used Florence</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. I felt staff gave me enough support before I used Florence</td>
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<tr>
<td>3. I felt comfortable using a mobile phone with Florence</td>
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<tr>
<td>4. I feel confident that Florence protected my personal information or data</td>
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<tr>
<td>5. Florence was easy to use</td>
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</tr>
<tr>
<td>6. Florence was better than coming to hospital for blood pressure checks</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7. Florence was better than having my midwife come to my house for blood pressure checks</td>
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</tr>
<tr>
<td>8. I feel that using Florence to watch my blood pressure was safe</td>
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<td></td>
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<tr>
<td>9. Florence helped me to manage my own health better</td>
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<tr>
<td>10. I feel I understand more about my blood pressure problem</td>
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<tr>
<td>11. The lack of human contact when I used Florence did not bother me</td>
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<tr>
<td>12. Florence saved me time</td>
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<tr>
<td>13. I felt less anxious after using Florence</td>
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<tr>
<td>14. Staff get a good understanding of my blood pressure problem using Florence</td>
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<td></td>
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<tr>
<td>15. Communication with my doctor/nurse/midwife was better because I used Florence</td>
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<tr>
<td>16. I feel Florence should become a standard service in pregnancy care in the future</td>
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</tbody>
</table>
12. **Before** you started using Florence, how much did you feel in control of managing your own health? (Tick one box)
- Not at all in control
- A little bit in control
- In control – enough for me
- Completely in control

13. Did you have high blood pressure monitored in a previous pregnancy? Yes □ No □ □

If YES – how did monitoring your blood pressure with Florence this time compare to how you were managed then? (Tick one box)
- Definitely not as good as last time
- Not quite as good as last time
- About the same as last time
- Better than last time
- Much better than last time

14. How likely would you be to recommend Florence to friends or family if they needed similar care or treatment? (Tick one box)
- Extremely likely to recommend
- Likely to recommend
- Neither recommend or not recommend
- Unlikely to recommend
- Extremely unlikely to recommend
- Don’t know

15. **After** you have used Florence, how much do you feel in control of managing your own health? (Tick one box)
- Not at all in control
- A little bit in control
- In control – enough for me
- Completely in control

15. If you have any other comments you’d really like us to know about using Florence - good or not so good - please write them down here:

THANK YOU FOR YOUR HELP
- Please hand the questionnaire back to your midwife or nurse
Best use of IT to support clinical treatment and care

This category is sponsored by:
GENERAL DYNAMICS
Information Technology

Roundhouse, London – 9 Oct
### ‘Problems’

First 10 weeks – 42 patients

<table>
<thead>
<tr>
<th>Location</th>
<th>PIH</th>
<th>GDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunderland</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>QEH</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>S Tyne</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

- Getting staff ‘enthused’...
- ‘Victims of our own success’ for PIH
  - guidance revision & implementation
- No health economist.....
Solutions

- End October – approached JCUH & Friarage
- Enthusiastic response! (… useful to them)
- Attended Project review meeting 10 Nov 2014
- CCG confirmation 25 Nov – fingers crossed!
- Training arranged
- Implementation 1 Dec 2014
- Follow with GDM pathway
Solutions

• Amended entry criteria for PIH pathway:
  ▪ 28+0 to 37+6  NOW  20+0 to 37+6
  ▪ Removed ‘essential hypertension’ as exclusion
  ▪ Exclude ‘pre-existing’ diabetes only

• ‘Virtual’ Health Economist appointed:
  • Andrew F Smith PhD - MedMetrics Inc.
  • www.medmetricsinc.com
  • ….within budget!
Where are we headed?
MECS in Maternity Care - getting the ideas out there...


Evaluation of telehealth monitoring in pregnancy using a multimatrix, multipartner model

Kim Hinshaw*, Rahul Nayyar*, Cathy Emmerson*, Janette Johnson*
Paul Marriott* & Telehealth Implementation Team

Background & Pilot work – City Hospitals Sunderland & Northern Senate
- Incorporating telehealth within the clinical setting can redress the balance between increased disease prevalence, patient safety & self-care, with health economic benefit.
- We implemented clinical pathways for mild pregnancy-induced hypertension (PIH) & gestational diabetes mellitus (GDM), using the ‘Simple Telehealth’ Florence teletext mobile phone-based system as a suitable adjunct to the antenatal service.

PIH - affects up to 10% of 1st pregnancies
- THEN: Multiple visits to hospital (or home by midwife)
- NOW: Safe evidence-based (NICE) BP parameters set
- Simple cheap equipment provided & pathway established
- Monitoring at home x3 weekly then reviewed after 1 week

GDM - affects up to 3.5% of pregnancies (20,400 UK/yr)
- THEN: Weekly visits to hospital consultant clinic
- NOW: Simple cheap equipment provided & pathway established
- Treatment altered by SYSTEM and/or by CLINICIAN by text
- On average, patients use ‘Flo’ system for 12-13 weeks

EARLY OUTCOMES – (1) - Patient satisfaction & control
- PIH (n=54) -- Level of control ['enough/completely'] = ↑46 to 81% after telehealth
- PIH -- 100% system easy to use & 100% felt it 'better than last pregnancy' (if had ↑ BP)
- GDM -- DTSQ validated = ↑ scores: satisfaction, convenience, flexibility & understanding

EARLY OUTCOMES – (2) - Health economics & potential cost-savings (crude)
- 'Simple Telehealth' costs ~£80/patient/year
- PIH -- ↓midwifery/hospital visits (x5 visits over 2 weeks)
- GDM -- ↓hospital visits (reduce by 3-4 visits/pt)

SAVING £300/pregnancy
SAVING £1024/pt/year

Ongoing AHSN funded project – progress
- Set up across South of Tyne & Wear
- QEH/CHS/STyne & Univ of Sunderland
- Same clinical pathways used by all units
- Health economics advisor secured
- Evaluation: patient satisfaction/control, HE & ease/difficulty of implementation

KEY BENEFITS & OUTCOMES
- System is ‘simple’
- Short term benefits to patients – control, satisfaction
- Benefits to system – staff re-deployed
- Possible cost-savings
- [?Longer-term health benefits?]

*Departments of Obstetrics & Diabetes/Endocrinology, City Hospitals Sunderland NHS Foundation Trust
*NHS England Northern Senate
Mr Kim Hinshaw, Cons Obstetrics, Dr Rahul Nayyar, Cons Diabetes, Mr Paul Marriott, Telehealth Consultant
NHS England TECS - Clinical Advocates 2014
Contact via: kim.hinshaw@lineone.net
Summary

• Patient-delivered home monitoring for mild PIH & GDM using simple Telehealth technology is realistic & deliverable.

• Pregnant women find the technology easy to use, the concept highly acceptable & GDM medication adjustment is practical via SMS.

• We are working hard at implementation across 4 sites now

• Evaluation is in place.......
Thank You