Development of a Remote Patient Monitoring Program for Management of Hypertensive Disorders of Pregnancy

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Background

- Hypertensive disorders of pregnancy (HDP) account for significant maternal morbidity
- Early interventions in HDP benefit the patient and prevent complications
- Monitoring of HDP can precipitate necessary interventions
- Monitoring is typically done through office visits and sometimes in an inpatient setting, but exploration of remote monitoring of patients with HDP is a growing field
- Remote monitoring of patients with HDP is a worthy goal for financial benefits and patient comfort

Problem Statement

The purpose of this project is to develop a remote patient monitoring program for management of hypertensive disorders of pregnancy through creation of a clinical algorithm

Methods

- Literature review conducted using the JBI scoping methodology[1]
- Terms “remote monitoring hypertensive disorders of pregnancy” inputted into PubMed
- Results evaluated for patient population of pregnant women with hypertensive disorders of pregnancy, and the role and effectiveness of remote monitoring in these conditions
- 34 articles resulted; it was narrowed down to 14 relevant articles (Figure 1)
- Inclusion/exclusion criteria outlined and iteratively determined through discussion with LVHN Maternal Fetal Medicine (MFM) experts
- Clinical algorithm created, iteratively adjusted through feedback and consensus building[2] with LVHN Chief of MFM, experts in data collection and EPIC capabilities, and group discussion among MFM experts
- Grant applied to from the Pennsylvania Medical Society (PAMED), and earned, to obtain funds for startup costs for this project, allowing the project to sustain itself
- Data pulled from inpatient hospital stay of three patients fitting criteria to compare inpatient costs to costs expected from proposed remote monitoring program as proof of concept

Results

- Literature review demonstrated 14 articles relevant to topic, including those relevant to cost analysis (Fig. 1)
- Programmatic workflow was designed and adjusted through iterative process consulting with experts in MFM (Dr. Rochon, Dr. Romagano, Dr. Durie) and data management staff (EPIC, tableau, financial services) (Fig. 2)
- Program components include: EPIC dashboard to track patients, Tableau reports to monitor metrics, companion app to monitor patient responses, and kit containing blood pressure cuff, scale, pulse oximeter, fetal heartrate Doppler, and communication modem
- Comparison of costs for 3 patients demonstrated a decrease in costs of 97.8% - 98.4% if remote monitoring had been used (Table 1)
- PAMED grant was applied to and awarded

Figure 1. Consort Diagram of scoping review of Remote Monitoring in HDP

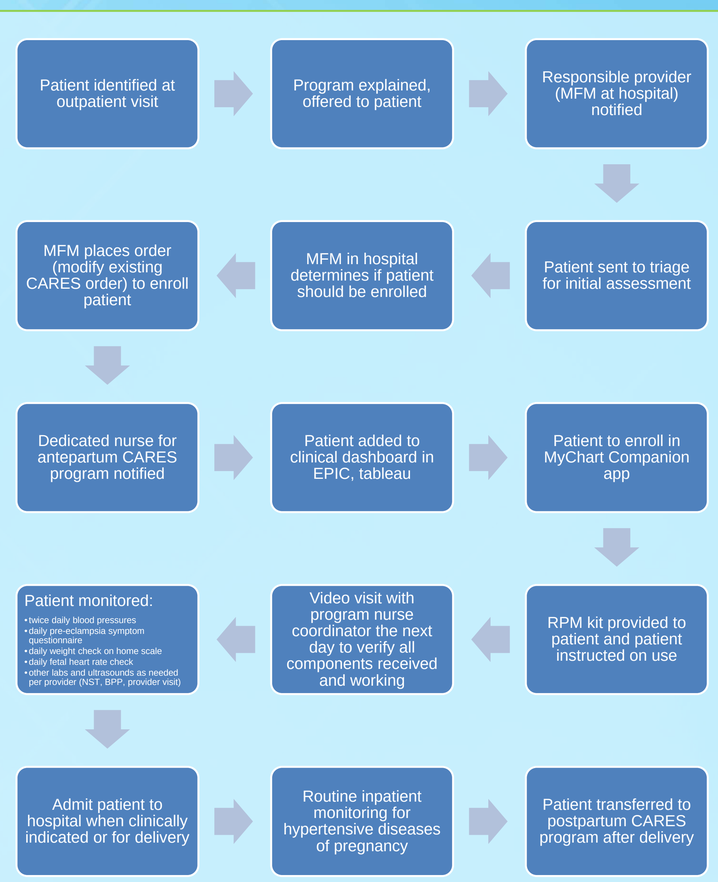

Figure 2. Final Version of programmatic workflow of clinical protocol of Remote Monitoring of HDP

Patient #	Total Inpatient Charges	Hospital Charges (not including delivery)	Expected Costs for Remote Monitoring	Costs Saved	Percentage of Costs Saved
1	172190.55	78634.03	1640	76994.03	97.9
2	137715.33	103205.75	1640	101565.75	98.4
3	317244.73	283184.36	5165	278019.36	98.2

Table 1. Examination of 3 sample patients, looking at costs of inpatient stay for monitoring of HDP, compared with costs for remote monitoring, and the cost savings $(\frac{HC-RM}{HC})100$

Discussion

- More consensus building could have made protocol development process more robust, including discussion with clinical and support staff, and patients
- Health Systems was incorporated in the development of this clinical protocol and workflow, including improving cost for patients and improving access to healthcare through remote monitoring
- SDL goal of effective use of all resources was partially achieved – more would have better facilitated consensus building and a diverse workforce, but would have limited efficiency

Conclusions

- Remote Monitoring in HDP is a burgeoning field worthy of further exploration
- Creation of a clinical algorithm and protocol is an iterative process requiring attention to detail, consensus building, and understanding of health systems
- Cost savings are a strong motivator from a patient and health systems perspective, and are demonstrated with this project

REFERENCES

1. Peters MDJ, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, McInerney P, Godfrey CM, Khalil H. Updated methodological guidance for the conduct of scoping reviews. JBI Evid Synth. 2020 Oct;18(10):2119-2126. doi: 10.11124/JBIES-20-00167. PMID: 33038124.
2. Safdar B, Greenberg MR. Organization, execution and evaluation of the 2014 Academic Emergency Medicine consensus conference on Gender-Specific Research in Emergency Care - an executive summary. Acad Emerg Med. 2014 Dec;21(12):1307-17. doi: 10.1111/acem.12530. Epub 2014 Nov 24. PMID: 25420469; PMCID: PMC4340245.