Using Automated Voice Calls to Improve Adherence to Iron Supplements During Pregnancy: A Pilot Study

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Maternal Anemia in India

- In India, 87% of pregnant women are anemic
  - Leads to 40% of maternal deaths & poor child health
- Iron supplements can reduce anemia, but most women do not take prescribed medication
  - Poor relationship with care provider
  - Negative perception of pills
  - Forgetfulness
  - Side effects (nausea, constipation, etc.)

Galloway R, McGuire J., *Determinants of compliance with iron supplementation: supplies, side effects, or psychology?,* Soc Sci Med. 1994 Aug;39(3):381-90.

Extensive Research to Improve Adherence, with Mixed Results

BMC Health Services Research

BioMed Central

Research article

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Patient adherence to medical treatment: a review of reviews

Sandra van Dulmen*[1], Emmy Sluijs[1], Liset van Dijk[1], Denise de Ridder[2], Rob Heerdink[3] and Jozien Bensing[1]

"The study is a review of 38 systematic reviews"

"Although successful adherence interventions do exist, half of interventions seem to fail"

"Non-adherence rates have remained nearly unchanged in the last decades"

Mobile Solutions in Developing Regions

- Prior work in ICTD has used mobile phones to combat anemia [Ramachandran et al.; MOTECH]
- Prior work has also shown rigorous medical benefits of SMS reminders for literate users
  - 20 of 25 RCTs show a significant result [Krishna et al.]
- But until now, *no rigorous evaluation* of any mobile intervention to improve medication adherence among low-literate populations

Ramachandran et al., Research and reality: using mobile messages to promote maternal health in rural India, *ICTD,* 2010.

Krishna, S., Boren, S., & Balas, E. A. (2009). Health Care via Cell Phones: A Systematic Review. *Telemedicine and eHealth*, *15*(3), 231-240.

Research Question

- Can automated voice reminders improve the adherence of pregnant women to iron pills?

- Target population:
  - Lower-education, lower-income women
  - Not familiar with SMS
  - Own (or usually answer) a cell phone
  - Have reliable access to iron supplements

Baseline Survey

- 50 pregnant women from Sion Hospital, Mumbai
- Good access to iron pills, but low adherence
  - 92% received iron tablets, but only 30% had finished
  - 26% could not explain the purpose of taking drug
  - 54% cited forgetfulness as the main barrier
- Good access to cell phones, but not SMS
  - 94% had access to phone, but only 38% read SMS

Conclusion: opportunity to reduce forgetfulness and increase knowledge using voice messages

Study Design

- 130 women randomized across two conditions:
  - Control: initial counseling session
  - Intervention: initial counseling + 3 messages / week
- Measurement: Hb levels in blood
  - Before and after 3 months of intervention

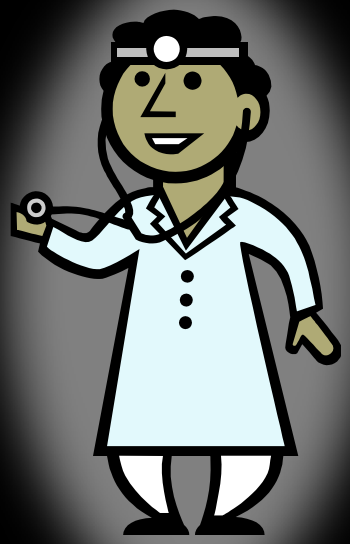
Design of Voice Messages

30-second messages, repeated twice per call

1. Positive affective appeals
   "Soon your child will start to sense the sounds around you"

2. Addressing salient beliefs
   "You may experience some constipation. This is expected. Take lots of water"

3. Designed for personalization and trust
   - In the language of their choice (Hindi / Marathi)
   - Customized to their stage of pregnancy
   - In the voice of doctor who enrolled them
   - From phone number stored in their handset
   - Delivered on days and time of their choosing



Enrollment Criteria

1. In the second trimester of pregnancy (13th to 28th week)
2. Carrying their own phone, which they answer themselves
3. Have anemia (by the WHO definition of at most 11 g/dL of Hb)
4. At most 10 years of education
5. Do not read SMS messages

Baseline suggests that 28% of women satisfy these criteria

The Average Participant

- 24 years old
- Household income of $120 / month
- Received 7.8 years of education
- Had 0.7 prior pregnancies
- Were enrolled at the 16th week of pregnancy
- Came for follow-up after 13 weeks

Photo: ARMMAN

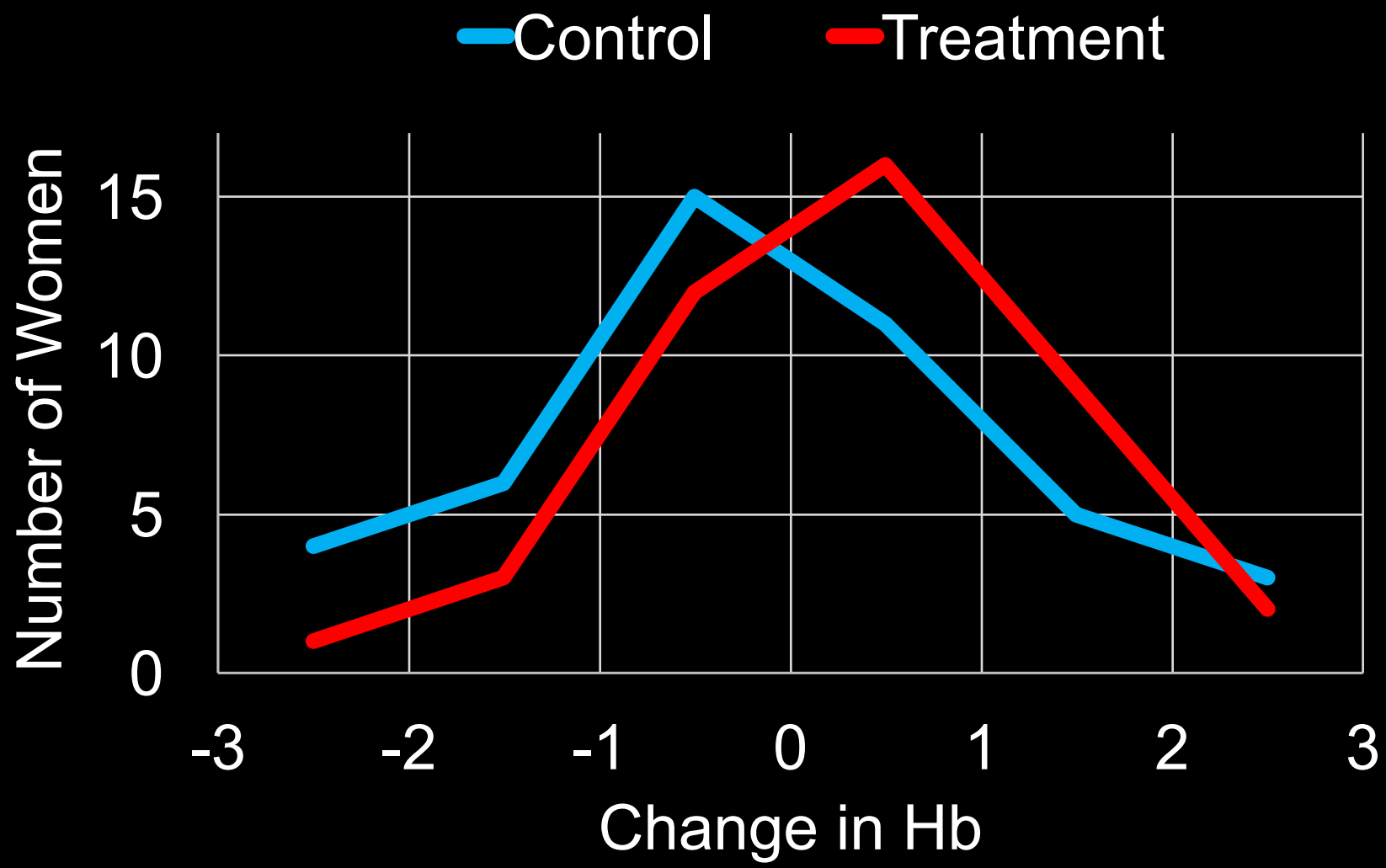
Difficulty with Follow-up

- Of 130 women enrolled, we retrieved only 79 for follow-up
  - 25% were completely unreachable
  - Others were not persuaded to return to hospital
- In future: anticipate change of phone number!
  - Take alternate phone number (spouse, neighbor, etc.)
  - Perhaps write a message on the patient's SIM card, reminding them to notify you if they change number

Results: Delivery of Messages

- On average, each woman answered 24 calls
  - This is 61% of the calls placed over 13 weeks
  - Answered calls lasted 40 seconds on average
- Women expressed gratitude for messages and desired to continue receiving them

Results: Impact on Hb Levels



Discussion

- Small effect size
  - Our intervention: 0.43 g/dL
  - Other successful interventions: up to 2 g/dL
- But small cost as well
  - About $0.19 per woman (if calls are $0.01 / min)
  - Translates to 10% of the cost of medication
- Thus, cost/benefit ratio might be promising?
  - Hard to compare to other interventions

How to Replicate and Improve Our Results

- We want to facilitate replication of this study
  - Work in progress: mMitra program by ARMMAN
- Our content and tools are openly available
  - 96 voice messages [http://bit.ly/voicemessages]
  - IVR Junction for voice calls [http://ivrjunction.org]
- Avoid our mistakes!
  - Losing 39% of the women for follow-up
  - Insufficient monitoring of the supply of medications

Conclusions

- Despite broad interest in improving adherence to medication, no rigorous evaluation to date of any mobile intervention for low-literate users
- We contribute a rigorous review, methodology, and pilot study with promising, but not conclusive, results
- We are eager to facilitate larger replications of this study and to help others benefit from our lessons learned

Extra Slides

Several False-Starts!

- We enrolled **126 women** with an imprecise iron test (Sahli test); threw out this data
- We enrolled **50 women** in a manual follow-up condition; did not have personnel to complete
- We enrolled **20 women** who did use text messaging; decided to be more selective