Implementation Science in Low-and Middle-Income Countries: Case Studies from Rural China

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Today’s Journey

• What do we know?

• What we do not know?

• What did we do?
Today’s Journey

• **What do we know?**
  - The Burden
  - The Gap
  - The Bridge

• **What we do not know?**

• **What did we do?**
KNOW: The burden

Cardiometabolic Disease

Hypertension
高血压

Diabetes
糖尿病

Heart disease
心脏病

Stroke
脑卒中
Causes of Death Distribution in 2017 - Data from 195 countries

- 34% Cardiometabolic disease
- 17% Cancer
- 49% Others

Source: The Global Burden of Disease

数据来源：全球疾病负担, v2017
KNOW: The burden

~ 245 million with hypertension

~ 2.45 亿人患 高血压
~ 100 million with Diabetes
~ 1 亿人患 糖尿病
KNOW: The burden

Heart attacks
心脏病突发

Stroke
中风
KNOW: The burden

Common, Growing, Severe, and Incurable

普遍的，与日俱增的，严重的，不可治愈的
Rural vs Urban China

- Similar or larger disease burdens, esp. among the “left behind” elderly
- Lower social and economic development levels
- More limited healthcare resources
KNOW: The gap

Preventable 80% 可预防的
Prevention is the key
预防是关键
Manageable
可管理的
KNOW: The gap
Know: the Bridge for Secondary Prevention of Cardiometabolic diseases

- The importance of primary care
- Allied healthcare professionals
- Training and incentives
Today’s Journey

• What do we know?

• What we do not know?

• HOW

• What did we do?
Our Main Approach
Implementation Science
Translational Research

Scientific evidence
Clinical guidelines

Health services
Actual practices

The science-practice gap

Cases from Rural China
Today’s Journey

- What do we know?
- What we do not know?
- What did we do? Hybrid 1 trials
  - China Rural Health Initiative
  - SimCard Study in Tibet, China
  - SINEMA study in Hebei, China
Take-Home Message First: 5S principle™

Simple (Kiss!) → Content
Slim → Process
Smart → Approach
Scalable → Space
Sustainable → Time

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China Rural Health Initiative: Specific Aim

To evaluate the effect of:

A simplified, low-cost, standardized management program of CVD high-risk* patients, delivered by village doctors, on systolic blood pressure and other indices of clinical care at the population level.

*High cardiovascular risk defined as:
1) physician diagnosis of coronary heart disease, or
2) physician diagnosis of stroke, or
3) older age (men > 50 and women > 60 years old) and diabetes, or
4) older age and measured systolic blood pressure ≥160 mmHg.
Study Design

- Cluster-randomized, controlled trial
- 120 rural villages from:
  - 120 townships (one village/township)
  - 10 counties
  - 5 provinces
- Equal randomization
  - 60 int. villages
  - 60 control villages
  (usual care)
- **Standardized management**
  - "Train the trainers" model to screen, manage, and refer high-risk patients

- **Performance feedback**
  - Centralized web-based database
  - Key performance indicators
  - Performance feedback semi-annually

- **Incentives to providers**
  - Performance based, semi-annually
  - In collaboration with local health authorities
# Clinical Outcomes
(Baseline and pre-post changes*)

<table>
<thead>
<tr>
<th>Category</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiving regular primary care</td>
<td>Baseline: 9.4%</td>
<td>Diff: 9.4%</td>
</tr>
<tr>
<td>Receiving advice for lifestyle changes</td>
<td>Baseline: 10.1%</td>
<td>Diff: 19.3%</td>
</tr>
<tr>
<td>Being treated with BP lowering drugs</td>
<td>Baseline: 2.5%</td>
<td>Diff: 10.5%</td>
</tr>
<tr>
<td>Being treated with aspirin</td>
<td>Baseline: 3.4%</td>
<td>Diff: 8.9%</td>
</tr>
</tbody>
</table>

* $P \leq 0.001$ for net between-arm diff. for all outcomes.
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**THANK YOU!**
A qualitative evaluation of a simplified cardiovascular management program in Tibet, China

Maoyi Tian¹,²,³, Xuejun Yin¹,⁴, Danzeng Dunzhu⁵, Zhong Liu⁵, Cong Li¹,⁶, Hao Sun⁷, Ci Song⁵, Laba Sangzhu⁵, Anushka Patel²,³, Julie Redfern²,³*, and Lijing L. Yan¹,⁸*
Method – intervention

Electronic Decision Support System (EDSS)

2 Lifestyle Modifications

Salt Reduction | Smoking Cessation

Low-dose Diuretics | Aspirin

2 Drug Prescriptions
What can we do about cardiometabolic diseases? - GOOD NEWS
Use of evidence-based medicine (%)

- Anti-hypertensive Rx
  - Baseline
  - Follow-up

- Aspirin
<table>
<thead>
<tr>
<th>Key themes</th>
<th>Major findings</th>
</tr>
</thead>
</table>
| Perceived usefulness of the risk management program | - High-risk community members were satisfied with the intervention.  
- Most villages doctors maintained a positive attitude on the program. |
| Content of risk management program           | - EDSS was a promising tool for CVD management.  
- EDSS needed to be designed in local language.  
- Mobile or wireless internet signals needed to be improved.  
- The use of western medications was a concern among the high-risk community members. |
| Fidelity to the risk management program      | - Lack of knowledge, and traditional cultural belief were the main barriers to medication adherence.  
- Village doctors showed a high level of fidelity to the intervention. |
| Barriers and facilitators to implementation  | - Lack of trained personnel, large existing workload, financial incentive, and transportation were identified as major challenges for implementation. |

System-Integrated Technology-Enabled Model of Care Aiming to Improve the Health of Stroke Patients in Resource-Poor Settings in China (SINEMA Study)
Diagram of the SINEMA Model - Old
Diagram of the SINEMA Model - New
Interventions for Village Doctors

Training
Training has been provided by health professionals and researchers to all village doctors in the intervention group.
Village doctors were trained about:
• Essential medicine (antiplatelet, statins, antihypertensive agent) use
• Behavior change for improving patients’ medication adherence and physical activity level
• Use of SINEMA App for patients’ monthly follow-up

Patients’ monthly follow-up
Village doctors in the intervention group will provide monthly follow-up to patients.
During the follow-up visits, village doctors will:
• Measure patients’ blood pressure, evaluate patients’ medication use and adherence supported by SINEMA App
• Provide health education to patients about medication adherence and physical activity supported by follow-up forms

WeChat group activities
Village doctors’ sharing experience, their thoughts and suggestions through WeChat group to promote peer-learning

Financial incentives
Village doctors will be provided with basic salary and bonus (master of BP control, active contributor, stroke fighter, good keeper).
SINEMA App as a Tool for Village Doctors

1. Acute event diagnosis
   Assist in diagnosing acute stroke event/cases need medical referral

2. Record blood pressure level
   Recording blood pressure level and displaying blood pressure trends

3. Record hospital visit history
   Recording patients’ hospital visit history and tests/physical checking results

4. Evaluating medication use
   Assist in evaluating medication use and medication adherence

5. Provide health education
   Assist in providing health education

6. Provide performance indicators
   Display performance indicators to assist patients’ management

7. Remind patients’ visits
   Providing reminders for patients’ monthly visit

8. VD training information
   Providing information to assist VDs’ self-learning
Interventions for Stroke Patients

Briefing
A briefing session was organized in each village in the intervention group. During the session, the team introduced the SINEMA project, provided a brief health education session on the importance of blood pressure control, medication adherence and physical activity.

Monthly follow-up
Stroke patients will be followed up by village doctors each month. During the follow-up visit, they should be noticed about their blood pressure level, receive health education on medication use and set a goal for physical activity.

Voice messages
Patients will receive a voice message every day at 7 am. The voice messages remind their medication taking and physical activity, as well as provide health education to patients.
Voice Messages for Stroke Patients

- Every morning at 7am, patients will receive one voice message.
- The message bank contains 300+ messages and the main content of the messages are reminders for medication taking and physical activities.
- Each message includes 3 parts:
  - A reminding sentence: “Have you taken your medicine today?” or “Do you remember to do physical activities?”
  - Health education information
  - Specific suggestions to encourage behavior change or remove potential barriers
- The voice messages were recorded with local dialect.
## Results on fidelity

<table>
<thead>
<tr>
<th>Level</th>
<th>Indicators</th>
<th>Definitions and measurements</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Village doctors</td>
<td>Participation of training session</td>
<td>Number of training session participated based on the signed participants’ list for each training session</td>
<td>21 VDs (84.0%) attended both sessions; 4 VDs (16%) attended 1st session only</td>
</tr>
<tr>
<td></td>
<td>Patients’ Follow-up visits</td>
<td>Percent of completed follow-up visits among total required follow-up visits based on the information entered in APP</td>
<td>VDs conducted (301.24 \pm 38.65) visits on average during the whole intervention period.</td>
</tr>
<tr>
<td></td>
<td>Active in virtual communication</td>
<td>Number of messages sent from village doctors in the online Wechat group during the intervention period.</td>
<td>VDs sent (37.44) messages on average to the Wechat group</td>
</tr>
<tr>
<td>Patients</td>
<td>Follow-up visits</td>
<td>Number of completed follow-up visits based on the information entered in APP (Required: 1 visit per person per month, for 12 months)</td>
<td>Mean number of visit is (11.82 \pm 1.11); 73/637 patients (11.5%) received less than 12 visits</td>
</tr>
<tr>
<td></td>
<td>Number of answered voice messages</td>
<td>Number of answered voice call based on the information provided from the message-sending system (Total days of sending voice messages: 284)</td>
<td>mean value on days of unanswered voice messages is (131.28 \pm 85.2); 143/510 patients (28.0%) answered less than half (142 days) of the daily voice messages.</td>
</tr>
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</table>
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Take Home Messages from Our Journey Today

• The challenges we face are enormous, and doing implementation research is not easier.

• Focus on what we can do, one study at a time, and learn from our past experiences

• Collaborate and engage

• K.I.S.S. (5Ss)
Young researchers

 CMD Research Group & MScGH Students
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Duke Kunshan University 昆山杜克大学
Photos by Jingjing Xu 徐菁菁拍摄

年轻的研究生
References


Enying Gong (co-first author), Wanbing Gu (co-first author), Erdan Luo, Liwei Tan, Julian Donovan, Cheng Sun, Ying Yang, Longkai Zang, Peng Bao, Lijing L. Yan. Development and Local Contextualization of mHealth Messages for Enhancing Disease Management among Community-dwelling Stroke Patients in Rural China: A Mixed-methods Study. (Accepted by *JMIR mHealth and uHealth* on September 30th, 2019)