



Direct to Consumer Telemedicine Platforms & the Market for Medical Advice in China

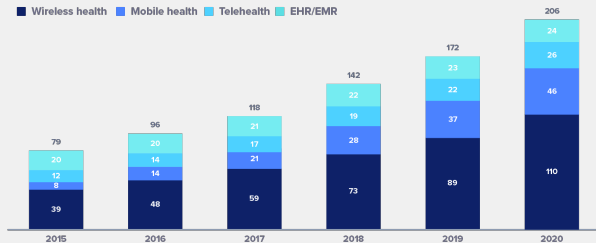
Hao Xue, Karishma D'Souza, Yian Fang, Aiqin Wang, Winnie Yip, Dong Xu, Wenjie Gong, Weiming Tang, Junzhang Tian, **Sean Sylvia**

Triangle Health Economics Workshop, 1.29.2021

China is at the Forefront of the Adoption of Digital Health Technology

- Tremendous growth in telehealth market globally, \$19.5bn by 2025
 - This prediction **before** COVID-19
- China, other middle-income countries rapidly adopting
- 44% of consumers in China prefer online interaction with provider (vs. 27% in 15-country Phillips Future Health Index)

Value of global digital health market by major segment from 2015 to 2020
(in billions of USD)



Source: QuickBooks Commerce

- **Telehealth** = broad use of ICT to share health information
 - training, clinical, pop health services, administration
- **Telemedicine** = between patient and provider
- **Direct-to-Consumer (DTC) Telemedicine** = patient-initiated telemedicine
Elliot & Shih 2019
 - Mainly with providers with whom they have **no established relationship**
 - In U.S.: Teledoc, Doctor on Demand, etc; In China: 微医, 好大夫 etc
- DTC telemedicine industry has been largely unregulated

1. Descriptive results from first round of China DTC Telemedicine Platform Survey
2. Planned RCT of Telemedicine Kiosks in Rural Villages

DTC consultations will fundamentally change the market for medical advice...or not



Increase in competition

- With onsite providers and between platforms, docs on platforms
- Providers can cheaply enter geographically disperse markets
- Lower search costs for patients

Or not

- Complementary service: Supplementary medical advice (second opinions)
- Service differentiation, scale vs. scope
- Network effects (multisided platforms externalities)

Depends on platform design, provider behavior, and nature of patient demand

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Depends on **platform design**, **provider behavior**, and **nature of patient demand**

- Survey/census of the DTC telehealth market in China – the country experiencing the most rapid growth of commercial DTC platforms
- **Objectives:**
 1. **Systematic enumeration & description** of operating DTC telehealth consultation providers
 2. **Measure quality** of medical advice
 3. **Assess relationship** between platform characteristics and quality
 4. **Compare to traditional onsite care** available in rural areas
- **Headline Findings:**

- Survey/census of the DTC telehealth market in China – the country experiencing the most rapid growth of commercial DTC platforms
- **Objectives:**
- **Headline Findings:**
 - **36 platforms** providing synchronous consultations via video, telephone, or text as of November 2019
 - **Wide variation** in platform structure (source of physicians, physician rating schemes, fees, drug sales)
 - **Fees strong predictor** of diagnostic quality as measured by SP interactions
 - **Better quality** compared to rural onsite providers, **but DTC providers over-refer (& overtreat?)**

Data Collection

Results

- Platform structure

- Quality of DTC Medical Advice

- Correlation between Platform Characteristics & Quality

- Comparison with rural onsite providers

Discussion

Village Telemedicine Kiosk RCT

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Village Telemedicine Kiosk RCT

1. Systematic enumeration of telehealth platforms (August 2019)
 - Comprehensive list of “Internet Hospitals” providing synchronous telemedicine consultations
 - Manual scrape of platform characteristics

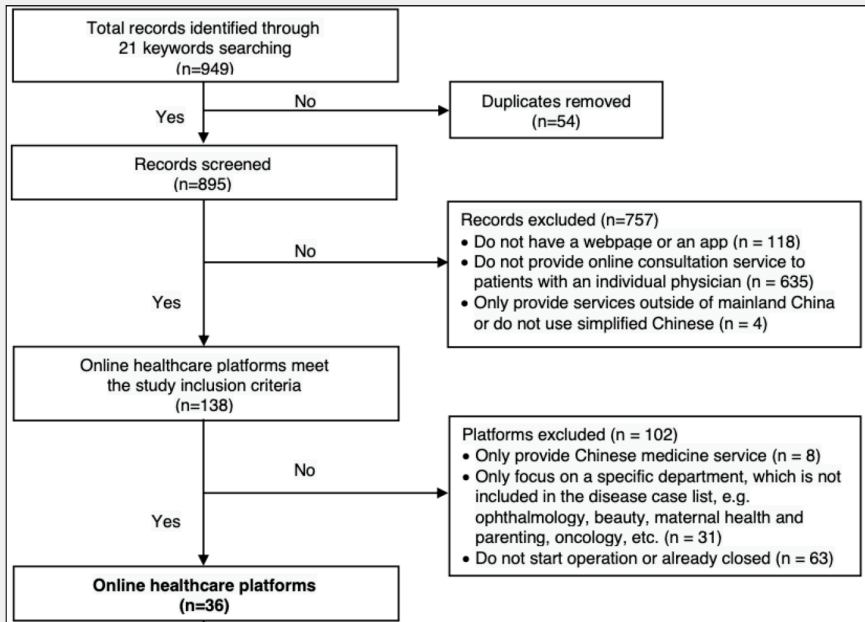
2. Standardized patient visits (Oct. & Nov. 2019)
 - Actors recruited and trained to consistently present 7 disease cases
 - Observers record details of interactions
 - Physicians DO NOT know they are being evaluated
 - Waiver of informed consent

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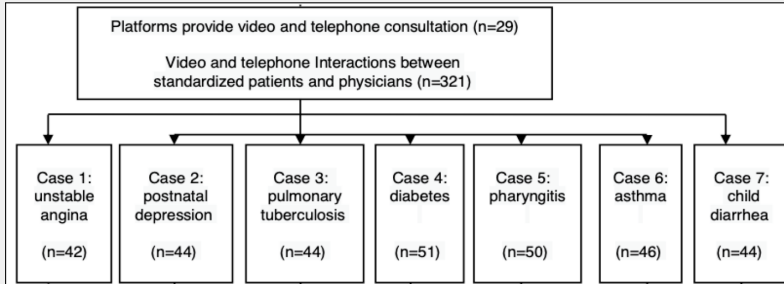
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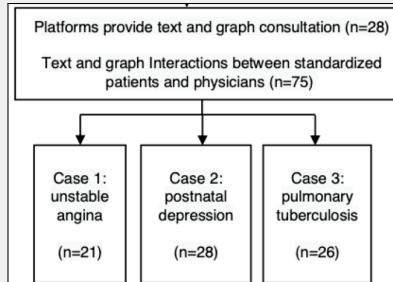
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Video & Telephone Consultations



SMS Consultations



- **Process Quality:** Completion of recommended checklist items
 - Based on nat'l & WHO guidelines
- **Diagnostic Accuracy**
- **Correct Case Management (Treatment)**
- **Referral Recommendation:** Necessary & Unnecessary
- **Drugs:** Correct, Unnecessary, Number, TCM/CPM
- Consultation fees

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Platform Characteristics

	All (N=36)	Online Only Platforms (n=31)	Based in Physical Hospitals (n=5)
Platform sells drugs (1=Yes)	22 (61%)	19 (61%)	3 (60%)
Physicians are from more than one province (1=Yes)	29 (81%)	27 (87%)	2 (40%)
Consultation fee is set by platform (rather than physician) (1=Yes)	8 (22%)	7 (23%)	1 (20%)
Ratings for physicians are available on the platform (1=Yes)	28 (78%)	26 (84%)	2 (40%)
Rating type			
Five-star	23 (64%)	21 (68%)	2 (40%)
Percentage	9 (25%)	8 (26%)	1 (20%)
Word comments	3 (8%)	3 (10%)	0 (0%)
Type of consultation			
Text and graphic	28 (78%)	26 (84%)	2 (40%)
Telephone or video	29 (81%)	24 (77%)	5 (100%)
Access methods available			
Android APP	35 (97%)	30 (97%)	5 (100%)
IOS APP	34 (94%)	29 (94%)	5 (100%)
Website	24 (67%)	20 (65%)	4 (80%)
WeChat mini program	15 (42%)	13 (42%)	2 (40%)

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Quality of Care (SP interactions)



	Mean (SD) or n (%)			Adjust Difference (95% CI)	
	Full Sample (N=321)	Online Only Platforms (n=275)	Based in Physical Hospital (n=46)	Online Only vs Physical-based	P-value
Average consultation fee (Chinese Yuan)	69.4 (63.4)	68.1 (57.1)	77.1 (93.0)	10.7 (-56.5 - 77.8)	0.75
Process quality					
Proportion of recommended checklist items	27.0 (13)	27 (13)	25 (14)	-2% (-10% - 6%)	0.61
Proportion of essential checklist items	36 (19)	36 (19)	37 (21)	0 (-11 - 10)	0.93
Diagnosis					
Correct diagnosis, if any	186 (61%)	168 (64%)	18 (42%)	-17.31% (-33% - -1%)	0.03
Partially correct diagnosis, if any	69 (23%)	52 (20%)	17 (40%)	23.71% (-6% - 53%)	0.11
Case Management					
Correct management	81 (25%)	75 (27%)	6 (13%)	-17.96% (-30% - -6%)	0.0034
Partially correct management	161 (50%)	135 (49%)	26 (57%)	6.75% (-5% - 18%)	0.24

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Drugs					
Prescribed drugs	148 (46%)	130 (47%)	18 (39%)	-14.54% (-31% - 2%)	0.09
Number prescribed, if any	2.27 (1.18)	2.28 (1.19)	2.22 (1.17)	-0.12 (-0.56 - 0.33)	0.59
Harmful drugs	25 (17%)	22 (17%)	3 (17%)	-2% (-11% - 6%)	0.62
Referral					
Referred to local hospital	252 (79%)	217 (79%)	35 (76%)	0% (-71%-71%)	1.00
"Unnecessary" referral, if any	86 (31%)	73 (31%)	13 (32%)	0% (-12%-12%)	0.99

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Logistic Regressions



	Proportion of Checklist		Correct Diagnosis		Correct Management		Correct Meds		Consultation Fee (IHS function)	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Platform is based in a physical hospital (1=Yes)	-0.001 (-0.04-0.04)	0.97	-0.13 (-0.23-0.018)	0.02	-0.2 (-0.37-0.03)	0.02	-0.14 (-0.23-0.05)	0.0033	-0.3 (-1.57-0.96)	0.63
Platform sells drugs (1=Yes)	0.02 (-0.001-0.04)	0.06	-0.08 (-0.15-0.014)	0.02	0.04 (-0.02-0.1)	0.19	0.06 (-0.03-0.22)	0.14	-0.26 (-0.85-0.33)	0.37
Physicians are from more than one province (1=Yes)	-0.04 (-0.09-0.008)	0.1	0.15 (-0.02-0.33)	0.08	-0.02 (-0.18-0.14)	0.79	0.27 (0.13-0.41)	0.0002	2.27 (0.82-3.7)	0.003
Consultation fee is set by platform (rather than physician) (1=Yes)	-0.01 (-0.03-0.01)	0.35	-0.06 (-0.13-0.03)	0.19	-0.04 (-0.12-0.03)	0.21	-0.03 (-0.2-0.14)	0.74	-1.6 (-2.43-0.79)	0.0003
Ratings for physicians are available (1=Yes)	0.06 (-0.02-0.14)	0.13	-0.09 (-0.23-0.05)	0.21	-0.03 (-0.22-0.15)	0.74	-0.42 (-0.59-0.26)	<0.0001	0.35 (-0.7-1.4)	0.50
Consultation fee (Chinese Yuan, IHS)	0.01 (0.003-0.02)	0.01	0.04 (0.01-0.07)	0.005	0.01 (-0.04-0.07)	0.85	-0.05 (-0.1-0.01)	0.02	—	—

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Platform is based in a physical hospital (1=Yes)	-0.001 (-0.04-0.04)	0.97	-0.13 (-0.23-0.018)	0.02	-0.2 (-0.37-0.03)	0.02	-0.14 (-0.23-0.05)	0.0033	-0.3 (-1.57-0.96)	0.63
Platform sells drugs (1=Yes)	0.02 (-0.001-0.04)	0.06	-0.08 (-0.15-0.014)	0.02	0.04 (-0.02-0.11)	0.19	0.09 (-0.03-0.22)	0.14	0.26 (-0.25-0.77)	0.37
Physicians are from more than one province (1=Yes)	-0.04 (-0.09-0.008)	0.1	0.15 (-0.02-0.33)	0.08	-0.02 (-0.18-0.14)	0.79	0.27 (0.13-0.41)	0.0002	2.27 (0.82-3.7)	0.003
Consultation fee is set by platform (rather than physician) (1=Yes)	-0.01 (-0.03-0.01)	0.35	-0.06 (-0.16-0.03)	0.19	-0.04 (-0.12-0.03)	0.21	-0.03 (-0.2-0.14)	0.74	-1.6 (-2.43-0.79)	0.0003
Ratings for physicians are available (1=Yes)	0.06 (-0.02-0.14)	0.13	-0.09 (-0.23-0.05)	0.21	-0.03 (-0.22-0.15)	0.74	-0.42 (-0.59-0.26)	<0.0001	0.35 (-0.7-1.4)	0.50
Consultation fee (Chinese Yuan, IHS)	0.01 (0.003-0.02)	0.01	0.04 (0.01-0.07)	0.005	-0.01 (-0.04-0.02)	0.65	-0.05 (-0.1-0.01)	0.02	—	—

Regressions control for consultation type and disease case fixed effects. Standard errors are adjusted for clustering at platform level.

Logistic Regressions



	Proportion of Checklist		Correct Diagnosis		Correct Management		Correct Meds		Consultation Fee (IHS function)	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Platform is based in a physical hospital (1=Yes)	-0.001 (-0.04-0.04)	0.97	-0.13 (-0.23-0.018)	0.02	-0.2 (-0.37-0.03)	0.02	-0.14 (-0.23-0.05)	0.0033	-0.3 (-1.57-0.96)	0.63
Platform sells drugs (1=Yes)	0.02 (-0.001-0.04)	0.06	-0.08 (-0.15-0.014)	0.02	0.04 (-0.02-0.11)	0.19	0.09 (-0.03-0.22)	0.14	-0.26 (-0.85-0.33)	0.37
Physicians are from more than one province (1=Yes)	-0.04 (-0.09-0.008)	0.1	0.15 (-0.02-0.33)	0.08	-0.02 (-0.18-0.14)	0.79	0.27 (0.13-0.41)	0.0002	2.27 (0.82-3.7)	0.003
Consultation fee is set by platform (rather than physician) (1=Yes)	-0.01 (-0.03-0.01)	0.35	-0.06 (-0.16-0.03)	0.19	-0.04 (-0.12-0.03)	0.21	-0.03 (-0.2-0.14)	0.74	-1.6 (-2.43-0.79)	0.0003
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Regressions control for consultation type and disease case fixed effects. Standard errors are adjusted for clustering at platform level.

Agenda

Data Collection

Results

- Platform structure

- Quality of DTC Medical Advice

- Correlation between Platform Characteristics & Quality

- Comparison with rural onsite providers

Discussion

Village Telemedicine Kiosk RCT

Mean (SD) or n (%)	DTC Platforms		Onsite Rural Providers		
	Video & Telephone (N=130)	SMS (n=47)	Village Clinics (n=226)	Township Health Centers (n=621)	County Hospitals (n=62)
Average consultation fee (Chinese Yuan)	68.50 (62.03)	30.24 (31.69)	10.50 (17.88)	17.53 (26.26)	39.06 (46.75)
Proportion of recommended checklist items	28% (11%)	18% (10%)	18% (12%)	22% (11%)	22% (14%)
Correct diagnosis, if any	57 (46%)	14 (36%)	17 (9%)	93 (17%)	12 (27%)
Correct or partially correct case management	100 (77%)	40 (85%)	95 (42%)	246 (40%)	26 (42%)
Referral to onsite hospital	116 (89%)	40 (85%)	89 (39%)	174 (28%)	–
"Over-referral"	33 (25%)	5 (11%)	7 (3%)	20 (3%)	–
Drugs prescribed	64 (49%)	10 (21%)	142 (63%)	351 (57%)	28 (45%)
Correct drugs	19 (30%)	1 (10%)	8 (10%)	21 (10%)	2 (9%)
Contraindicated drugs	10 (16%)	8 (80%)	97 (68%)	275 (78%)	20 (71%)

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Village Telemedicine Kiosk RCT

- Effects of DTC expansion on quality and costs uncertain
- Whether welfare improving will depend on platform, provider, patient behavior
- **Scope for policy & regulation to shape incentives**
- Pure DTC may not work with elderly in rural areas
- RCT on **Telemed Kiosks with village docs** →



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Village Telemedicine Kiosk RCT

Village Telemedicine Kiosk RCT - Background

- Public provincial-level hospital
- Existing telemedicine platform (40,000 visits per day)
- Setting up telemedicine kiosks in 2,277 village clinics across province
 - Allows existing village doctors to connect, together with patients, to providers in provincial hospital
 - Gives village doctors access to artificial intelligence-based diagnostic tool (chatbot)
- **Study questions:**
 - Will village docs have incentives to use platform? Drug sales revenue vs. increased patient demand
 - What will be net effect on quality of care, patient & system costs?

Treatments

1. **Telemedicine Kiosk:** Village clinicians given equipment and technical training
2. **Kiosk + Incentives:** Cap. fee to village clinician for each patient going through platform, randomized between small (2 yuan) and large (10 yuan)
3. **Demand-side Marketing:** Marketing/information to households about kiosk available in village clinic

Partial cross-cutting design:

Primary Group	A. Demand-side Marketing	B. No Marketing
Group 1: Standard of Care Control	56 townships	
Group 2: Telemedicine Kiosk	28 townships	28 townships
Group 3: Kiosk + Incentives	28 townships	28 townships

- Randomization: Township-level randomization (1-2 sample villages per township), blocked by county

Primary:

1. Health-seeking (village clinic utilization, bypassing, self-treatment)
2. Recall-based quality indicators for set of diseases (child diarrhea, asthma, angina)

Secondary:

1. Kiosk/Telemedicine use
2. Household reported OOP expenditures
3. Village clinic revenue
4. Village clinic drug sales (including Antibiotics, Chinese medicine)