

A Guide to Remote Patient Monitoring

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The Inevitability of Remote Patient Monitoring

The world is aging quickly. And with these demographic changes, a dramatic paradigm shift is required in how healthcare is delivered.

The U.S. Census Bureau has projected that by 2030, more than 20 percent of U.S. residents will be 65 and over. And more than one-third of all active physicians will be 65 or older in the next ten years.

This has profound implications for our healthcare infrastructure:

- The U.S. will face a shortage of up to 120,000 physicians by 2030.¹
- The labor force in the U.S. will shrink and strain funding for safety net programs like Medicare.

Leveraging technology to deliver care that is more efficient, without compromising quality, can address demographic challenges, and physician and funding shortages.

The Centers for Medicare & Medicaid Services (CMS) has recognized that expansion of Remote Patient Monitoring is crucial for developing and scaling a sustainable healthcare system. For 2018 and 2019, CMS is covering new billing codes under the Physician Fee Schedule to reimburse providers for chronic care routinely furnished via communication technologies.

What Is Remote Patient Monitoring?

Remote Patient Monitoring (sometimes called telemonitoring) is the collection of health data by a patient, often from outside conventional care settings, which is then electronically and securely transmitted to a provider (sometimes via a data processing service) for use in care and related support.

For example, a patient while at work or home routinely records KardiaMobile electrocardiograms (ECGs), and checks blood pressure with an Omron cuff. The data is instantly uploaded to the KardiaPro platform. The patient's provider logs in to KardiaPro to review a summary report of the patient's health data, then communicates the treatment plan to the patient by phone or email.

¹ The Complexities of Physician Supply and Demand: Projections from 2016 to 2030. Association of American Medical Colleges. March 2018.

What Are the Aims of Remote Patient Monitoring?

REMOTE PATIENT MONITORING AIMS TO PROMOTE THE TRIPLE AIM²:

1. Improve the patient experience of care

The healthcare experience is associated with burdensome travel requirements and long waits. Many patients who are sick or suffer from chronic conditions tend to wait for their illnesses to progress to a stage where it is more expensive and more difficult to address than if prevention and/or treatment had been provided earlier. As the Medicare population explodes in size, more patients will seek care from a system struggling to grow with the demand. Access to care must be enhanced. Tech-driven tools can make healthcare more accessible and user friendly.

2. Improve the health of populations

Large institutions have demonstrated that populations with chronic conditions can improve health outcomes with Remote Patient Monitoring. Providers can increase their geographic scope with Remote Patient Monitoring.

3. Reduce the per capita cost of health care

Home-based care can be cost-effective, as demonstrated by several projects at major health care institutions.

What Is the Evidence for Remote Patient Monitoring?

FEDERAL AGENCY META-ANALYSIS

The Agency for Healthcare Research and Quality's 2016 meta-analysis³ of remote patient monitoring used 17 systematic reviews comprised of 202 individual studies and 48,321 patients, and found "sufficient evidence to support the effectiveness of . . . remote patient monitoring for patients with chronic conditions such as cardiovascular and respiratory disease."

2 Berwick DM, Nolan TW, Whittington J. The triple aim: care, health, and cost. *Health Aff (Millwood)*. 2008;27(3):759-69.

3 Agency for Healthcare Research and Quality. *Telehealth: Mapping the Evidence for Patient Outcomes From Systematic Reviews*. 2016; <https://effectivehealthcare.ahrq.gov/topics/telehealth/technical-brief>.

REAL-WORLD EVIDENCE FROM HEALTH SYSTEMS

Large health systems are using Remote Patient Monitoring because it can substitute for otherwise more costly health care services including hospitalizations or emergency room visits for unmanaged chronic conditions. These systems, like Medicare, bear risk along the continuum of care. Although there are costs associated with delivering care through Remote Patient Monitoring, it allows for moving sites of care to lower cost centers.

Veterans Administration (VA): Since 2000, the VA's Care Coordination/Home Telehealth (CCHT) program has provided remote management of veteran patients with chronic conditions using home telehealth and disease management technologies. In 2016, the VA has provided 2.17 million episodes of care via telehealth, serving more than 702,000 veterans. Multiple published studies have shown that the VA remote management program has improved access to care, improved health outcomes, reduced hospitalizations, reduced VA costs.⁴

Ochsner Health System's digital hypertension program was associated with significant improvement in blood pressure control rates and lifestyle change. 156 patients submitted at least one blood pressure reading per week, and received medication management and lifestyle recommendations via a clinical pharmacist and a health coach. At 90 days, 71% of patients enrolled in the program had achieved target blood pressure control, versus 31% of patients in usual care.⁵

University of Virginia Health System (UVA): Since 2013, UVA has offered remote monitoring services to more than 3,000 patients after hospitalizations for heart attack, heart failure, COPD, pneumonia, CABG, stroke, and total joint replacement. Care coordination with Remote Patient Monitoring has reduced 30-day hospital readmissions by more than 40%, regardless of payer.⁶

4 Chumbler NR, Kobb R, Harris L, et al. Healthcare utilization among veterans undergoing chemotherapy: the impact of a cancer care coordination/home-telehealth program. *J Ambul Care Manage.* 2007;30(4):308-317.

Darkins A, Ryan P, Kobb R, et al. Care Coordination/Home Telehealth: the systematic implementation of health informatics, home telehealth, and disease management to support the care of veteran patients with chronic conditions. *Telemed J E Health.* 2008;14(10):1118-1126.

Barnett TE, Chumbler NR, Vogel WB, Beyth RJ, Qin H, Kobb R. The effectiveness of a care coordination home telehealth program for veterans with diabetes mellitus: a 2-year follow-up. *Am J Manag Care.* 2006;12(8):467-474.

5 Milani RV, Lavie CJ, Bober RM, Milani AR, Ventura HO. Improving Hypertension Control and Patient Engagement Using Digital Tools. *Am J Med.* 2017;130(1):14-20.

6 Dewberry P, Short M, Tucker AL. Post-Acute Remote Care Management to Lower 30-day Readmissions. University of Virginia Health Systems.; 2015.

University of Mississippi Medical Center (UMMC): The first 100 diabetes patients in UMMC's statewide Remote Patient Monitoring program, launched in 2014, collectively saved roughly \$400,000 in healthcare costs and reduced A1c levels by 1.7%.⁷ This program included a tablet assigned to a patient, enabling uploading of data from a variety of home-based devices, and equipped with video conferencing link to care managers. Using this data, cost analyses estimate that if 20 percent of Mississippi's diabetic population were enrolled in the program, it would save the state \$189 million in Medicaid dollars per year.⁸

Medicare: CMS's chronic care management (CCM) program provides longitudinal non-face-to-face clinical services for Medicare beneficiaries with at least 2 chronic conditions. CCM can include Remote Patient Monitoring services. During the program's first two years (2015-2017), CCM was associated with reductions in emergency department visits, hospitalizations, and use of skilled nursing facilities.⁹

Essentia Health: This 16-hospital and 68-clinic system uses Epic electronic health records (EHR) and tele-scales to monitor heart failure patients after hospitalization. The data is reviewed in the EHR and nurses can readily respond to patients. In Essentia's heart failure tele-scale program, less than 2% of heart failure patients were re-hospitalized within 30-days post-discharge, significantly below the national average of 25%.¹⁰

7 UMMC Health Care. Remote Patient Monitoring for Providers. <https://www.umc.edu/Healthcare/Telehealth/Remote-Patient-Monitoring/remote-patient-monitoring-for-providers.html>, 2018.

8 Federal Communications Commission. Carr Announces \$100 million 'Connected Care Pilot Program.' 2018; <https://www.fcc.gov/document/carr-announces-100-million-connected-care-pilot-program>.

9 Schurrer J, O'Malley A, Wilson C, McCall N, Jain N. Mathematica Policy Research. *Evaluation of the Diffusion and Impact of the Chronic Care Management (CCM) Services: Final Report*. 2017.

10 Essentia Health slashes readmissions with population health initiative, telehealth. <https://www.healthcareitnews.com/news/essentia-health-slashes-readmissions-population-health-initiative-telehealth>.

FEATURED REMOTE PATIENT MONITORING RESEARCH FOR CLINICAL USE CASES

Hypertension

- Logan AG, Irvine MJ, McIsaac WJ, Tisler A, Rossos PG, Easty A, et al. Effect of home blood pressure telemonitoring with self-care support on uncontrolled systolic hypertension in diabetics. *Hypertension*. 2012;60(1):51-7.

110 patients with hypertension and diabetes were randomized to self-care messages on the smartphone immediately after each blood pressure reading, versus usual care. Physicians were alerted if patients' blood pressure crossed specific pre-set thresholds, and regular feedback was provided to patients and clinicians. At 12 months, mean ambulatory systolic blood pressure decreased significantly in the self-care support group, by 9.1 +/- 15.6 mmHg. 51% of self-care support subjects achieved the guideline recommended target of <130/80 mmHg, compared with 31% of control subjects.

- Margolis KL, Asche SE, Bergdall AR, Dehmer SP, Groen SE, Kadrmas HM, et al. Effect of home blood pressure telemonitoring and pharmacist management on blood pressure control: a cluster randomized clinical trial. *JAMA*. 2013;310(1):46-56.

450 adults with uncontrolled blood pressure were randomized to usual care or to a telemonitoring intervention, with home blood pressure telemonitors that transmitted blood pressure data to pharmacists, who adjusted antihypertensive therapy. Blood pressure was controlled at 12 months in 57% of the intervention group and 30% of the usual care group; 6 months after the trial ended, 72% of patients in the intervention group and 57% of patients in the usual care group had controlled blood pressure. On average, in the intervention group, systolic blood pressure decreased 10.7 mmHg at 6 months and 6.6 mmHg at 18 months.

Atrial Fibrillation

- Hickey, KT, Biviano BA, Garan H, Sciacca RR, Riga T, Warren K, et al. Evaluating the Utility of mHealth ECG Heart Monitoring for the Detection and Management of Atrial Fibrillation in Clinical Practice. *J Atr Fibrillation*. 2017;9(5):1546.

The iPhone Helping Evaluate Atrial Fibrillation Rhythm through Technology (iHEART) study is a single center, prospective, randomized controlled trial. Participants with a history of atrial fibrillation were randomized 1:1 to receive the iHEART intervention, receiving a phone equipped with a KardiaMobile and behavioral altering motivational text messages, or usual cardiac care, for 6 months. KardiaMobile ECGs were reviewed daily, and any clinically significant arrhythmias were sent to the provider caring for the participant. A pilot cohort of 46 participants was evaluated. In the KardiaMobile group, 61% had recurrent AF/AFL versus 30% of controls (hazard ratio 2.55, 95% CI 1.06-6.11, p=0.04). Among the 13 patients with baseline and 6 month quality-of-life assessments, significant improvements were observed in the physical functioning (p = 0.009), role physical (p = 0.007), vitality (p = 0.03), and mental health domains (p = 0.02).

Diabetes

- Wild SH, Hanley J, Lewis SC, McKnight JA, McCloughan LB, Padfield PL, et al. Supported Telemonitoring and Glycemic Control in People with Type 2 Diabetes: The Telescot Diabetes Pragmatic Multicenter Randomized Controlled Trial. *PLoS Med.* 2016;13(7):e1002098.

321 patients with diabetes were randomized to a telemonitoring intervention with self-measurement and transmission to a secure website of twice-weekly morning and evening glucose for review by clinicians. The hemoglobin A1c for the intervention group was significantly lower over 9 months (7.9% versus 8.4%, $p=0.0007$). In a secondary analysis, there was significant lowering of systolic and diastolic blood pressure (3.06 mmHg and 2.17 mmHg lower, respectively) in the intervention group.

Cancer

- Kroenke K, Theobald D, Wu J, Norton K, Morrison G, Carpenter J, et al. Effect of telecare management on pain and depression in patients with cancer: a randomized trial. *JAMA.* 2010;304(2):163-71.

202 patients with cancer with randomized to receive a remote patient monitoring intervention, with automated home-based symptom monitoring by interactive voice recording or Internet. The intervention resulted in improved pain and depression outcomes at 3 and 12 months.

- Basch E, Deal AM, Kris MG, Scher HI, Hudis CA, Sabbatini P, et al. Symptom Monitoring With Patient-Reported Outcomes During Routine Cancer Treatment: A Randomized Controlled Trial. *J Clin Oncol.* 2016;34(6):557-65.

766 patients receiving routine outpatient chemotherapy for advanced solid tumors were randomized to symptom reporting by tablet, versus usual care. Nurses received email alerts when participants reported severe or worsening symptoms. Health related quality of life improved among more participants in the intervention group than usual care (34% vs. 18%, $p<0.001$), and declined by less in the intervention group than usual care (1.4 vs. 7.1-point drop, $p <0.001$).

Why Are There Many Negative Studies for Remote Patient Monitoring?

Despite years of telephonic remote monitoring success at large scale health systems, such as the Veterans Administration, and multiple meta-analyses that demonstrate the positive benefit of Remote Patient Monitoring, there are gaps in the evidence base.

Several highly publicized studies using Remote Patient Monitoring, particularly among patients with heart failure, have not demonstrated better outcomes.¹¹

Common pitfalls of studies evaluating Remote Patient Monitoring include:

- short follow-up time
- underpowered study
- low adherence
- patients are too ill or too healthy for Remote Patient Monitoring
- clinical outcomes, such as readmissions, are complex phenomenon, not solely limited to physiological variable management
- studies focus on the telecommunications aspect of remote patient monitoring and not the provider feedback intervention
- no reporting on outcomes that matter to patients (patient-reported health related quality of life, symptom severity, satisfaction with care)
- difficulty of changing health-related behavior
- reliance on patient-initiated communication
- providers/hospitals are challenged by the organization and interpretation of a large flow of data

For Remote Patient Monitoring to be effective, it must target the right conditions, promote patient adherence to data collection, and ultimately enable intervention that improves patient-reported quality of life and/or prevents avoidable high cost health care use, such as emergency room visits or hospitalizations.

11 Ong MK, Romano PS, Edgington S, et al. Effectiveness of Remote Patient Monitoring After Discharge of Hospitalized Patients With Heart Failure: The Better Effectiveness After Transition -- Heart Failure (BEAT-HF) Randomized Clinical Trial. *JAMA Intern Med.* 2016;176(3):310-318.

Cleland JG, Louis AA, Rigby AS, Janssens U, Balk AH, Investigators T-H. Noninvasive home telemonitoring for patients with heart failure at high risk of recurrent admission and death: the Trans-European Network-Home-Care Management System (TEN-HMS) study. *J Am Coll Cardiol.* 2005;45(10):1654-1664.

Chaudhry SI, Mattera JA, Curtis JP, et al. Telemonitoring in patients with heart failure. *N Engl J Med.* 2010;363(24):2301-2309.

How Does Medicare Define Remote Patient/ Physiologic Monitoring?¹²

Medicare envisions Remote Patient Monitoring services as involving the collection and interpretation of medical information without a direct interaction between the practitioner and beneficiary.

Medicare has asserted that services furnished remotely using communications technology are not considered “Medicare telehealth services” and are therefore not subject to the statutory restrictions articulated in section 1834(m) of the Social Security Act (see Appendix for further information).

Which Billing Codes Can Be Used for Reimbursement of Remote Patient Monitoring?¹³

Remote Patient Monitoring—also referred to as Remote Physiologic Monitoring—was initiated by Medicare in January 2018 with the unbundling of Current Procedural Terminology (CPT) billing code 99091 from the Chronic Care Management (CCM) program. Effective January 1, 2019, three new Remote Physiologic Monitoring codes are available (99453, 99454, 99457). These codes are a response to CMS’s request for codes that “better describe the role of remote patient monitoring in contemporary practice.” Information below is from the American Medical Association’s 2019 CPT Code Set.

PATIENT SET-UP AND EDUCATION

99453:

Remote monitoring of physiologic parameter(s) (eg, weight, blood pressure, pulse oximetry, respiratory flow rate), initial; set-up and patient education on use of equipment.

- do not report 99453 more than once per episode of care
- do not report for monitoring of less than 16 days
- do not report in conjunction with codes for more specific physiologic parameters (eg, 93296, 94760)
- may be used with either 99091 or 99457

12 It is always the Health system’s or provider’s responsibility to determine medical necessity, appropriate site of service, and submit appropriate codes, modifiers and charges for services rendered. Please contact your local payer/carrier and/or legal counsel for interpretation of coding and coverage.

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DEVICE AND TRANSMISSION OF DATA

99454:

Device(s) supply with daily recording(s) or programmed alert(s) transmission, each 30 days

- do not report for monitoring of less than 16 days
- do not report in conjunction with codes for more specific physiologic parameters (eg, 93296, 94760)
- may be used with either 99091 or 99457

INTERPRETATION AND MANAGEMENT

99091:

Collection and interpretation of physiologic data (e.g., ECG, blood pressure, glucose monitoring) digitally stored and/or transmitted by the patient and/or caregiver to the physician or other qualified health care professional, qualified by education, training, licensure/regulation (when applicable) requiring a minimum of 30 minutes of time.

- includes professional time associated with data accession, review and interpretation, modification of care plan as necessary (including communication to patient and/or caregiver), and associated documentation
- do not report in conjunction with 99457

99457:

Remote physiologic monitoring treatment management services, 20 minutes or more of clinical staff/physician/other qualified health care professional time in a calendar month requiring interactive communication with the patient/caregiver during the month.

- report once each 30 days, regardless of the number of parameters monitored
- do not report in conjunction with 99091
- do not count any time on a day when the physician or qualified health care provider reports an evaluation/management service
- do not count any time related to other reported services (eg, 93290)

Which Billing Codes
Can Be Used for
Reimbursement
of Remote Patient
Monitoring?
(Continued)

There are some important differences between 99091 and 99457:

99091	99457 ¹⁴
Must be physician or, subject to state law, qualified health care provider	May be clinical staff, physician, or qualified health care provider
Data does not have to be from a medical device	Data must be from a device as defined by FDA
30 minutes of time, per 30-day period	20 minutes of time, per calendar month

We will provide updates and education about the new 2019 Remote Patient Monitoring codes. KardiaPro will support Remote Patient Monitoring as the reimbursement for these services evolves.

**What Are Some
of the Barriers
to Adoption of
Remote Patient
Monitoring?**

In a 2016 survey published by the American Medical Association, 15 physicians reported a sense of enthusiasm for digital health, and were optimistic of its potential to improve practice efficiencies, patient safety and diagnostic ability; and reduce burnout.

Physicians rated the following elements as most important for adoption of digital health tools:

	Response
Proven effectiveness	There is vast, growing evidence of the value of Remote Patient Monitoring
Reimbursement	Medicare and other payers now reimburse for Remote Patient Monitoring
Workflow/Ease of Use	KardiaPro enables efficient collection and review of data that integrates into clinical workflow.

14 Jarrin R. Payment Reform to Support a New Culture. Healthcare Information and Management Systems Society 2018. 365.himss.org/sites/himss365/files/365/.../handout-20180306151913-CCC6.pdf

How Can an Effective Remote Patient Monitoring Program Be Created?

Effective Remote Patient Monitoring programs target the right conditions, promote patient adherence to data collection, and ultimately intervene to improve patient-reported quality of life and/or prevent avoidable high cost health care use, such as emergency room visits or hospitalizations.

Some tips for use of Remote Patient Monitoring in your practice:

- Track relevant clinical indicators, such as blood pressure or ECG.
- Target patients who are highly engaged and receptive to the technology.
- Track program metrics that align with your organization's broader strategic objectives. Metrics may include patient satisfaction or health care costs.

15 American Medical Association. Digital Health Study. Physicians' Motivations and Requirements for Adopting Digital Clinical Tools. . 2016. <https://www.ama-assn.org/survey-finds-physicians-enthusiastic-about-digital-health-innovation>.

WHAT IS THE HISTORY OF REMOTE PATIENT MONITORING?

CMS has begun to take important steps to better utilize connected health technology in several components of Medicare. The paradigm is shifting from low tech:high touch to high tech:low touch concurrent with the goal of improving patient outcomes at lower cost to the healthcare system.

2014	American Medical Association (AMA) created a Telehealth Services Workgroup to recommend solutions for the reporting of non-telehealth services when provided remotely utilizing telehealth technology.
2015	Medicare introduces Chronic Care Management (CCM) program for non face-to-face services over a calendar month.
2016	AMA Digital Health Survey: physicians optimistic that digital medicine tools will improve medical practice and patient care.
12/2016	Nearly 700,000 Medicare beneficiaries have received CCM services.
1/2017	AMA creates the Digital Medicine Payment Advisory Group (DMPAG)
9/2017	DMPAG proposes three new codes for Remote Patient Monitoring to the CPT Editorial Panel.
11/2017	CMS introduces CPT code 99091, unbundled from the Chronic Care Management program, for Remote Patient Monitoring. CMS also promotes Remote Monitoring interventions as part of the Quality Payment Program's merit-based incentive payment system (MIPS), via Improvement Activity IA_BE_14.
1/2018	99091 becomes effective as standalone and reimbursable code for Remote Patient Monitoring.
7/2018	CMS includes 3 new Remote Patient Monitoring codes from DMPAG in the 2019 Physician Fee Schedule Proposed Rule: 99453, 99455, and 99457.
1/2019	99453, 99455, 99457 become effective.

WHAT IS TELEHEALTH?

According to the Center for Connected Health Policy, telehealth is “a collection of means or methods for enhancing health care, public health, and health education delivery and support using telecommunications technologies.”¹⁶

Telehealth encompasses various clinical and non-clinical fields, such as professional education, home health, and disaster management. Telemedicine is often used to refer to traditional clinical diagnosis and monitoring that is delivered by that technology.

Telehealth Modalities

Live Consultation: live, two-way interaction between a patient and a provider using audiovisual telecommunications technology, serving as a substitute for an in-person encounter.

Store and Forward: electronic transmission of health documents from one provider to another provider, often a specialist, who uses the information for diagnosis or management, outside of real-time or live interaction.

Remote Patient Monitoring (or telemonitoring): the collection of health data by a patient, often from outside conventional care settings, which is then electronically transmitted to a provider (sometimes via a data processing service) for use in care and related support.

Mobile health (mHealth): mobile communication technologies that deliver health information, health services or public health practice and education. Examples including text messaging that promotes healthy behavior or alerts.

¹⁶ <http://www.cchpca.org/what-is-telehealth>

HOW DOES MEDICARE DEFINE TELEHEALTH?

State and federal agencies differ on how they define telehealth and associated modalities. These definitions also change over time. Yes, it is confusing!

Medicare telehealth services are defined under section 1834(m) of the Social Security Act:

1. Live consultation (real-time) with voice and video

- Store and forward permitted only in Federal demonstration programs in AK, HI

2. Patient geographic limitations

- Lives in a Health Professional Shortage Area (HPSA) outside of a Metropolitan Statistical Area (MSA)
- Rural census tract or in a county that is outside of an MSA

3. Patient originating site (must be located at)

- Provider offices
- Hospitals
- Critical access hospitals
- Rural health clinics
- Federally qualified health centers
- Skilled nursing facilities
- Community mental health centers
- Hospital-based or critical access hospital-based renal dialysis centers
- New in 2019: mobile stroke units, dialysis facilities, and homes of end-stage renal disease patients

4. Practitioners, subject to state law, must be physicians, nurse practitioners (NP), physician assistants (PA), nurse-midwives, clinical nurse specialists, certified registered nurse anesthetists, or registered dietitians or nutrition professionals.

Medicare **does not** define Remote Patient Monitoring as a telehealth service.

WHAT IS MEDICARE'S CHRONIC CARE MANAGEMENT (CCM) PROGRAM?

In 2015, Medicare began paying for non-face-to-face clinical services furnished to Medicare beneficiaries, with at least 2 chronic conditions, on a monthly basis. These services include communication with the patient and other treating health professionals for care coordination (both electronically and by phone), medication management, and being accessible 24 hours a day to patients and any care providers (physicians or other clinical staff). The creation and revision of electronic care plans is also a key component of CCM.

During the first two years of CCM, about 684,000 Medicare beneficiaries received CCM services; among providers using CCM, the median number of patients per provider was 10.¹⁸ Providers reported that CCM payment was inadequate for the CCM work required. The report found that, while CCM was associated with increased home health services and primary care visits, it was also associated with reductions in emergency department visits, hospitalizations, and use of skilled nursing facilities (SNFs).

In 2018, CMS took 99091, a code created for the CCM program, and made it independent (unbundled) from CCM. Effectively, the unbundling of 99091 heralded the beginning of CMS's support of Remote Patient Monitoring.

18 Schurrer J, O'Malley A, Wilson C, McCall N, Jain N. *Mathematica Policy Research. Evaluation of the Diffusion and Impact of the Chronic Care Management (CCM) Services: Final Report*. 2017.