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RESEARCH REPORT

The Cost-Effectiveness of Electronic Monitoring

2019 N° R-430

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The Cost-Effectiveness of Electronic Monitoring

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Executive Summary

Key words: *electronic monitoring, cost-effectiveness, community supervision, community corrections.*

The Correctional Service of Canada (CSC) conducted a three-year national Electronic Monitoring (EM) Research Pilot to examine its effectiveness in promoting positive community outcomes for federal offenders while maintaining public safety. This report focuses on evaluating the cost-effectiveness of EM compared to traditional supervision (i.e., community supervision without EM) and whether EM demonstrates potential cost-savings relative to other management approaches (e.g., maintaining an offender in a Community Correctional Centre (CCC) or a community residential facility (CRF)). In addition, this report also explored the time Parole Officers (POs) spent on EM related activities (e.g., making referrals, installing/removing EM devices, and managing and responding to alerts).

To allow for an estimation of costs and outcomes during a set time period, data were collected on a sample of 336 eligible EM participants who became active on EM between April 1, 2017 and March 31, 2018. The sample of 336 EM participants were compared to a control group of 336 offenders matched on demographic characteristics, offence and risk information and release characteristics. The two groups were compared on community supervision outcomes (e.g., suspensions/revocations), residency conditions, and frequency of contact between April 1, 2017 and March 31, 2019 to allow for a minimum one-year possible follow-up period per offender.

EM supervision is associated with substantial additional time requirements from POs. Additionally, POs received various alerts throughout the supervision period, with the majority encompassing general alerts not related to the supervision conditions of EM participants. In particular, equipment related alerts appear to occur most frequently. Considering the number of alerts, analyses revealed that most POs receive under 100 alerts per EM period. Despite the additional time associated with EM, there were no differences in frequency of contact between EM participants and non-EM offenders.

As one part of the cost-effectiveness analyses, this report compared the cost of EM to traditional supervision, demonstrating that EM was more expensive than supervision without the use of EM. With respect to outcomes, the EM participants had an equal number of suspensions and revocations compared to the control group. Combining the cost data with the outcome data, results from the cost-effectiveness analyses suggest that compared to traditional supervision, EM is more expensive but equally as effective in terms of reducing suspensions and revocations.

EM participants were significantly less likely to have a residency condition imposed on conditional release. EM may demonstrate potential cost-savings compared to the costs of maintaining an offender in a CCC or CRF if offenders for whom a residency condition would otherwise be imposed were instead supervised in the community with EM. While the current study does not endorse EM as a cost-effective tool, the findings of the overall pilot suggest that it offers added benefit over current practice in effectively supervising offenders who are conditionally released.

Table of Contents

| | |
|---|-----|
| Acknowledgements | ii |
| Executive Summary | iii |
| List of Tables | v |
| List of Figures | vi |
| List of Appendices | vii |
| Introduction..... | 1 |
| Cost-Analysis | 2 |
| Findings Regarding Cost-Effectiveness of EM | 3 |
| Impact of EM on Parole Officers' Time | 6 |
| The Current Report | 6 |
| Method | 8 |
| Procedure | 8 |
| Materials | 9 |
| Participants..... | 10 |
| Analytical Approach | 12 |
| Results..... | 18 |
| Utilization of EM | 18 |
| Time Associated with EM Related Activities..... | 21 |
| Community Supervision Outcomes | 28 |
| Cost- Effectiveness | 31 |
| Cost-savings of EM..... | 34 |
| Discussion | 35 |
| Conclusions..... | 36 |
| References | 41 |

List of Tables

| | |
|---|----|
| Table 1 <i>Regions of Staff with EM Experience</i> | 11 |
| Table 2 <i>CPORF Questionnaire Responses by Region</i> | 12 |
| Table 3 <i>Risk and Need Characteristics of EM Participants and Control Group</i> | 20 |
| Table 4 <i>Average Time Parole Officers Spent on Application and Removal Activities</i> | 22 |
| Table 5 <i>Nature and Types of Alerts Received by Parole Officers</i> | 27 |
| Table 6 <i>Comparison of Suspensions and Reasons for Suspension Between Groups</i> | 29 |
| Table 7 <i>Comparison of Revocations and Types of Revocations Between Groups</i> | 30 |
| Table 8 <i>EM Cost Data for 2017-2018</i> | 33 |
| Table 9 <i>Incremental Cost-Effectiveness Analyses</i> | 34 |

List of Figures

| | |
|--|-----------|
| <i>Figure 1. Range of Alerts Received by Parole Officers per EM Supervision Period.</i> | <i>25</i> |
| <i>Figure 2. Frequency of Contact (FOC) between EM Participants and Control Group</i> | <i>31</i> |

List of Appendices

| | |
|--|----|
| Appendix A: Definitions of Alerts..... | 45 |
| Appendix B: Average Time Parole Officers Spent on Application and Removal Activities | 47 |

Introduction

In recent years, the development of various monitoring techniques have changed the way offenders are managed and supervised. Due to the substantial costs associated with managing offenders in prison, governments and policymakers often look to develop more cost-effective community-based management approaches (Bartels & Martinovic, 2017). As such, various jurisdictions have started managing offenders through alternative practices to incarceration, such as through house arrest or through the use of electronic monitoring (EM). However, there are many jurisdictions that do not utilize EM as a program or as an alternative to prison, but instead as a tool to monitor those already under community supervision. At the federal level in Canada, EM is considered a discretionary supervision tool intended to complement, rather than replace, traditional methods of supervision.

The Correctional Service of Canada (CSC; 2009) previously conducted a one-year pilot of EM to test CSC's protocols, inform policy changes, identify additional training requirements, identify potential technological challenges as well as assess CSC's readiness to use EM with offenders. However, an in-depth examination of EM's effectiveness and efficiency was beyond the scope of that pilot. Legislative changes stemming from the 2012 passing of the *Safe Streets and Communities Act* provided CSC with the authority to require an offender to wear a monitoring device (McDonald, 2015). As such, a second pilot of larger scope was implemented with the aim of evaluating the possible effects of EM on offenders, staff, community supervision, and public safety. Within this context, CSC has been tasked by the Minister of Public Safety with conducting rigorous research on EM. This research will act as one component informing the eventual decision on a national EM implementation and will address the recommendations contained in the report of the Parliamentary Standing Committee (PSC) on Public Safety and National Security on EM.

Despite the proliferation of EM programs in Canada and in other jurisdictions, cost-analyses continue to be understudied. The purpose of this report is to address the recommendations put forth by the PSC as they relate to evaluating the cost-effectiveness of EM. In particular, this report will examine whether EM is cost-effective relative to traditional supervision (i.e., community supervision without EM) and whether EM demonstrates cost-savings relative to other management approaches (e.g., maintaining an offender in a Community

Correctional Centre (CCC), or in a community residential facility (CRF).

Cost-Analysis

Cost-analyses can provide a framework for comparing EM to other management approaches. More specifically, cost-analyses includes a set of four different, but related, approaches for evaluation and decision-making. As outlined by Levin & McEwan (2001) these include: (a) cost-effectiveness, (b) cost-benefit, (c) cost-utility, and (d) cost-feasibility. Cost-effectiveness is an approach used in evaluation research and refers to, “the evaluation of alternatives according to both their costs and their effects with regard to producing some outcome” (Levin & McEwan, 2001, p.10). This approach to cost-analysis can evaluate which program yields the highest level of effectiveness for a given cost. It entails combining cost data with effectiveness data (e.g., outcome data, such as reoffending rates) to produce a cost-effectiveness comparison. Cost-effectiveness assumes that only programs with similar or identical goals can be compared (e.g., programs aimed at reducing suspensions/revocations). In addition, this method can only compare a program relative to another and cannot evaluate a program in absolute terms.

Cost-benefit analysis evaluates alternatives according to their costs and benefits, where benefits are measured in monetary terms (Levin & McEwan, 2001). Thus, this approach determines whether the benefits exceed the costs. Cost-benefit analysis has the advantage of comparing many programs with different objectives; however, it can be difficult to systematically assign monetary values to benefits (e.g., expressing reductions in suspensions in pecuniary terms). Cost-utility analysis involves evaluating a program based on a comparison of their costs and their utility, where utility refers to the satisfaction derived by individuals from one or more outcomes. The goal is to choose an alternative that provides the greatest amount of utility or satisfaction for a given cost. Although this can promote stakeholder participation in decision-making, it may be difficult to arrive at accurate measures of individual preferences. Lastly, cost-feasibility analysis only requires estimating the costs of a program in order to determine whether the costs exceed the budget and other resources available. This method allows alternatives that are not feasible to be immediately ruled out, but it cannot evaluate the overall worth of a program because it does not incorporate outcome measures (Levin & McEwan, 2001).

With the purpose of evaluating the costs and outcomes of EM against traditional

supervision, this report will use a cost-effectiveness approach. One of the first steps in cost-effectiveness analyses is to specify the various elements of the intervention or program and determine the associated cost for each element. A review of the extant literature has demonstrated that there is a range in how EM-related costs are defined, categorized, and reported, which include: (a) costs by type, (b) tangible and intangible costs, and (c) outsourcing or leasing out costs. Costs by type involves dividing costs into categories such as personnel (e.g., salaries), facilities (i.e., the physical space required for the program), and equipment and materials (e.g., furnishings, instructional equipment). Tangible costs are measurable costs (e.g., costs of EM equipment and personnel) whereas intangible costs refers to costs associated with elements that either cannot be directly measured or measured with any degree accuracy (e.g., investments in the planning process for incorporating EM into existing correctional operations). Lastly, previous literature suggests that costs may be outsourced and contracted to security companies (Bourn, 2006; Jannetta, 2006; John Howard Society, 2000; Smith, 2001). For example, in some jurisdictions, security companies would operate EM systems, including the tracking of offenders (Richardson, 1999). Thus, in these instances, the costs derived from contractors would include pre-release costs, such as time and money spent on risk assessments carried out in prisons, the contracting costs to monitor the offenders' curfews or geographic conditions, as well as the cost of recall following a breach (Dodgson et al., 2001). This report will take the approach of restricting costs to those that are tangible and categorizing the cost of EM by type as it is a more straightforward approach to estimating costs.

Findings Regarding Cost-Effectiveness of EM

Despite the increased use of EM, there still remains limited empirical support for the effectiveness of EM in general and its cost-effectiveness in particular. Previous evaluations of EM have demonstrated inconclusive results and often lack an adequate comparison group (Bonta, Wallace-Capretta, & Rooney, 2000a; Gies et al., 2013; Omari & Turner, 2015; Renzema & Mayo-Wilson, 2005). Even among studies that have used a control group, results have been mixed. For example, some studies have demonstrated lower rates of recidivism among offenders placed on EM compared to a control group (Gainey, Payne, & O'Toole, 2000; Geis et al., 2012; Padgett, Bales, & Blomberg, 2006), while other studies have found similar rates of recidivism between the two groups (Bonta et al., 2000a, Bonta, Wallace-Capretta, & Rooney, 2000b; Finn

& Muirhead-Steves, 2002; Renzema & Mayo-Wilson, 2005; Sugg, Moore, & Howard, 2001). In addition, research on the cost-effectiveness of EM has primarily focused on examining EM as an alternative to incarceration, often in combination with home detention (Bonta et al., 2000a, Finn & Muirhead-Steves, 2002; Omari & Turner, 2015). Therefore, the manner in which EM is used within an organization can shape both the approach and the estimates used in cost-effectiveness analyses.

Notwithstanding the limitations of the studies examining the impact of EM, two relevant cost-effectiveness evaluations have recently been conducted with respect to the use of EM as a tool to monitor those already under community supervision. Gies and colleagues (2012) evaluated the effectiveness of Global Positioning System (GPS) monitoring of high-risk sex offenders on parole in California. Compared to a matched comparison group, the GPS group was less likely to be rearrested and less likely to violate conditions of their parole. In addition, the costs of the GPS monitoring program were compared to the costs of traditional supervision. The cost of the GPS supervision was placed at \$35.96 per day per parolee, while the cost of traditional supervision was \$27.45 – a daily difference of \$8.51. Combining the cost data with the outcome data, the study found that the GPS monitoring program cost less than \$1.00 per day to obtain a 1% decrease in arrests and \$11.00 per day per offender to obtain a 1% decrease in parole violations (Gies et al., 2012). In turn, the researchers concluded that the GPS program was more expensive but more effective than traditional supervision.

In a later study conducted using high-risk gang members, Gies et al. (2013) noted that offenders monitored using GPS were less likely to be rearrested, but more likely to violate their parole conditions than did offenders in the comparison group on traditional supervision. The GPS program was more expensive than traditional supervision, with a price differential of \$14.00 per day. The GPS program costs \$1.49 more per day per offender compared to traditional supervision to obtain a 1% decrease in arrests, but it costs \$10.77 per day per offender to obtain a 1% increase in parole violations. The authors concluded that while GPS monitoring carries a higher price tag, it may be more effective at detecting parole violations than traditional supervision. These findings also suggest that the cost-effectiveness of EM may be dependent on the offender group on which it is used. There may be certain types of offenders or conditions of release that result in improved cost-effectiveness. In addition, these two cost-effectiveness evaluations also demonstrate the difficulty in assessing the effectiveness of EM in general and

the cost-effectiveness in particular. While some might expect lower rates of suspensions and revocations under the assumption that EM performs a deterrent effect, it is also possible that the additional monitoring results in breaches or otherwise higher risk behaviour being detected. Therefore, when cost-effectiveness is measured in terms of reductions in recidivism alone, it ignores the complexity of the use of EM as a case-management tool.

The previous evaluation of the Electronic Monitoring Program Pilot (EMPP) undertaken by CSC in 2009 examined the costs of EM using project staff salaries, start-up costs for the National Monitoring Centre (NMC), EM device related costs, as well as portions of the NMC staff salaries. Of note, CSC currently uses a 24-hour NMC located in the CSC National Headquarters that provides additional support to POs who are monitoring offenders in the community using EM¹. The total annual cost of the EMPP amounted to \$856,096, with a projected average annual operating budget of \$1M. The evaluation examined the cost-saving value of EM relative to: supervision of an offender on statutory release with a residency condition; maintaining an offender in a CCC or community residential facility (CRF)²; and maintaining an offender in a minimum-security facility. Offenders who are released into the community with a residency condition reside in a CCC or CRF, where CSC spends an average of \$60,656 annually to maintain an offender in a CCC or CRF. The results demonstrated that EM would demonstrate cost-savings if at least 23 offenders for whom a residency condition would otherwise be imposed were instead released and maintained in the community for 365 days with EM. In addition, an offender released on day parole from a minimum-security facility would typically reside in a CCC or CRF. Therefore, EM would demonstrate cost-savings if at least 30 offenders were released and maintained on day parole for more than 365 days. Despite these potential cost-savings of EM, the cost-effectiveness associated with the EMPP was not demonstrated given the short period of implementation (CSC, 2009).

¹ The NMC is a CSC call centre that runs 24/7 and acts as an after-hours hub and a point of contact between CSC and various stakeholders. It provides support to other CSC programs, such as community staff safety, CSC tip line, AMBER alerts etc.

² A CCC is a federally operated community-based residential facility that provides a structured living environment with 24-hour supervision, programs and interventions for the purpose of safely reintegrating offenders into the community. A CRF is also a community-based residential facility but it is operated by a non-governmental agency or a provincial entity that also provides a structured living environment (CSC, 2019).

Impact of EM on Parole Officers' Time

Few studies have assessed the time required by POs to incorporate EM into their case management and supervision duties. CSC's 2009 evaluation of the EMPP found that the monitoring activities increased the Frequency of Contact (FOC) between POs and EM participants beyond the required number in policy.³ Although additional monitoring and response requirements may impact POs workload and possibly divert time away from other case management activities, the use of monitoring centres can reduce the impacts of these issues by prioritizing alerts before they are provided to the POs (Armstrong & Freeman, 2011; Gies et al., 2012; Gies et al., 2013).

Potential PO workload increases can stem from multiple factors, such as additional monitoring and response requirements related to EM (Gies et al., 2012). Furthermore, POs supervising offenders in the community using EM assume additional roles associated with EM, while also maintaining their regular caseload responsibilities. Armstrong and Freeman (2011) demonstrated that a large portion of a probation officer's time is spent responding to alerts triggered by a loss of satellite signal for offenders under GPS (i.e., false alerts). As previously mentioned, CSC uses a 24-hour NMC, which provides additional support to POs who are monitoring offenders in the community using EM. It is also expected that overall time spent on individual EM related activities, such as making referrals, installing/removing EM devices, and managing and responding to alerts, should decrease over time as POs become more familiar and acquire more experience with EM related activities (CSC, 2018b).

The Current Report

As part of the current research pilot, CSC has previously examined the implementation of EM, finding that the availability of EM appeared to have an impact on the decision-making processes of POs in regards to suspensions, but not on revocations of release (Hanby, Nelson, & Farrell-MacDonald, 2018). The most recent report examined community supervision outcomes associated with the use of EM as a supervision tool (Hanby, Ridha, Sullivan, Smeth & Farrell MacDonald, 2019). The findings of this study suggested that the use of EM might contribute to reducing recidivism. The utilization of EM as a supervision tool also demonstrated added

³ FOC refers to the number of face-to-face contacts an offender must have with their PO while under community supervision, which is typically determined by risk indicators and release characteristics.

benefits over traditional supervision in facilitating the safe reintegration of eligible offenders into the community. Despite these findings, there is limited research examining the cost-effectiveness of EM compared to traditional supervision. This report will contribute to research on EM by examining the cost-effectiveness of EM, where the results of this report may be utilized to help inform decisions on the continued use of EM within CSC. The following research questions will be addressed:

1. How much time do POs spend on EM related activities?
2. Are there differences in FOC between EM participants and the matched control group?
3. What are the costs associated with EM? What are the costs associated with traditional supervision (i.e., community supervision without EM)?
4. Is EM cost-effective relative to traditional supervision? That is, which approach can achieve the most effective outcome at the lowest cost?
5. Does EM demonstrate potential cost-savings relative to: maintaining an offender in a CCC or a CRF? In particular, how do the costs of EM compare to these approaches?

Method

Procedure

EM Research Pilot. The EM Research Pilot was a multi-year, national pilot project conducted by CSC. This research pilot utilized EM to monitor federal offenders with special geographic conditions (curfew and geographic restrictions). The project was implemented across the CSC regions (Ontario, Pacific, Prairies, Quebec, and Atlantic) in a phased approach starting in July 2015. EM is utilized by all federal parole offices, with the exception of three due to the lack of cellular coverage (Whitehorse, Yellowknife, and Iqaluit).

Within CSC, EM is used as a tool to monitor supervision conditions for offenders on conditional release; EM is not an alternative to incarceration or a residency condition. The decision to utilize EM was left to the discretion of the PO. Referrals by POs may have occurred at the beginning of the case management process (prior to release) or anytime the PO deemed that EM was necessary (during release). The final decision to utilize EM rested with the current supervising PO. Throughout the process, EM specialists (which in some cases was also the supervising PO) were available to assist with installation and removal of EM equipment as well as addressing any other EM-related issues. Alerts were first received, stored and addressed by CSC's National Monitoring Centre according to standardized monitoring and response protocols, and then certain alerts (e.g., tampering and exclusion alarms) were transmitted to POs for response when required.

Referral criteria. To be eligible for the EM Research Pilot, an offender must have been considered medium/high risk to re-offend. Offender risk was measured by the offender's Reintegration Potential⁴ (RP) rating in the pilot. To be referred to EM, offenders required a low/medium RP level at the time of referral. Offenders with high RP could be eligible for EM if they were men sex offenders with a Static-99R score of four or above, or if they were women sex offenders.

To be assigned to EM, an offender must have a parole condition that can be monitored using EM technology. There are two main types of conditions that can be applied to offenders on

⁴ For non-Indigenous men offenders, RP is determined by the scores from the Custody Rating Scale, the Revised Statistical Information on Recidivism and the Static Factor Rating. For women offenders and Indigenous offenders, RP is determined by the scores from the Custody Rating Scale, the Static Factor Rating, and the Dynamic Factor Rating (CSC, 2018a).

EM: geographic special conditions and curfews. Geographic special conditions usually refer to areas that the offender is restricted from entering. For example, a sex offender may be restricted from entering any parks, recreation centres, schools, and/or any other place where children are expected to congregate. The areas in which offenders are restricted from entering are often referred to as exclusion zones. Offenders may also be restricted from exiting an inclusion zone (e.g., the city where they live) as a geographic condition. In contrast, when a curfew is imposed, an offender is required to stay within a specified location (also referred to as an inclusion zone) for a given period of time. Usually, curfews occur overnight in the offender's residence.

Materials

Data for the analyses came from four types of sources: (a) various CSC databases including the Offender Management System (OMS) and the EM Research Tracking Database, (b) the EM software, (c) Staff questionnaire, and (d) CPORF questionnaire.

CSC databases. Data for EM participants and non-EM offenders were extracted from OMS, the automated system used by CSC to store decision-making and offender management data from the beginning of an offender's sentence until the sentence is complete. EM-specific data were stored in the Research Tracking database, which contained all of the EM participant data regarding referrals, activations, and removals.

EM software. The EM software⁵ (Veritracks 11.0 and 2.0) is maintained by the NMC and stores information regarding offender GPS location and alerts.

Staff questionnaire. CSC staff, namely Community Parole Officers (CPOs) and PO Supervisors, were given the opportunity to provide feedback on EM by completing an online questionnaire.⁶ The questionnaire is composed of 90-items examining staff perceptions of EM in regards to the effectiveness, efficiency, and cost-effectiveness of EM, as well as the impact of EM on staff decision-making and the daily lives of offender. The questionnaire consists of five sections: (a) Background (21 items), (b) EM as a supervision tool (18 items), (c) EM and case management (25 items), (d) Impact of EM on daily lives and relationships (9 items), and (e)

⁵ No identifiable offender data is inputted into the VeriTracks Software. Instead, the EM project team has created numerical identifiers that can be used within the system. Access to offender information is subject to regular auditing.

⁶ Various CSC staff as well as PBC Board members also completed the questionnaire. However, only CPOs and PO Supervisors are included in this report as questions related to cost-effectiveness were only administered to these staff groups.

Cost-effectiveness of EM (17 items). Distribution of the staff questionnaire was staggered across the regions. The first questionnaire was launched 10 months after the EM implementation date for each region (between May – October 2016). A follow-up questionnaire was sent six months after the first questionnaire was distributed (between November 2016 – April 2017). A final questionnaire was administered in September 2018 for all regions. The questionnaire was administered using SNAP software and was hosted online through CSC networks. Staff participants provided informed consent by agreeing to a statement prior to filling out the questionnaire.

CPORF questionnaire. The Community Parole Officer Resource Formula (CPORF) is a tool used by CSC to allocate CPO resources to each region. The CPORF Working Group initiated a review in 2016 to determine the time required for CPOs to utilize EM as a supervision tool (CSC, 2018b). Two online self-report questionnaires were developed and distributed across the regions between March 2016 and March 2017 to CPOs using EM as a supervision tool. In order to capture the time CPOs spend on the different EM related tasks, the first questionnaire focused on EM application processes while the second questionnaire focused on EM removal processes. The application questionnaire consisted of 52 questions regarding the pre-acceptance, pre-activation, pre-application, application, and other related activities associated with EM. The removal questionnaire was comprised of 58 questions that relate to the monitoring, removal, post-removal, and other activities related to the removal of EM. CPOs completed the questionnaires for device application and removal for each EM participant on their caseload, for up to a maximum of four offenders (CSC, 2018b).

Participants

EM participants. Data were collected for the eligible EM participants who became active on EM between April 1, 2017 and March 31, 2018 and were followed until March 31, 2019. The analyses will focus solely on distinct offenders who were ever active on EM that were on conditional release during the study period. While the second report of the research pilot (Hanby et al., 2019) used the full sample of eligible EM participants during the three years of data collection, this study is a supplementary report representing a sub-sample of EM participants. During the study period, a total of 336 offenders became active on EM. This group represents the experimental group in the study. The majority (98.2%, $n = 330$) of the sample

were men and only 1.8% ($n = 6$) were women. Of the offenders who became active on EM, 17.0% ($n = 57$) identified as Indigenous. The EM supervision period⁷ under examination was the first one for 83.0% ($n = 279$) of the sample, the second for 13.7% ($n = 46$), and the third supervision period or more for 3.3% ($n = 11$).

Staff. A total of 459 CPOs and 129 PO Supervisors completed the staff questionnaire across three data collection periods.⁸ Of the respondents, 244 had EM experience within the last six months and were thus retained for analyses. In particular, of the staff with EM experience 51.3% were CPOs ($n = 154$) while 30.0% were PO Supervisors ($n = 90$). The average length of experience working for CSC was 16.0 years ($SD = 7.3$). Of the staff with EM experience, 63.9% ($n = 154$) of respondents were women, while 36.1% were men ($n = 87$).⁹ Additionally, as shown in Table 1, most worked in the Quebec and Ontario regions.

Table 1

Regions of Staff with EM Experience

| Region ($N = 244$) | % | n |
|----------------------|------|-----|
| Atlantic | 9.4 | 23 |
| Quebec | 26.2 | 64 |
| Ontario | 37.3 | 91 |
| Prairie | 9.4 | 23 |
| Pacific | 17.6 | 43 |

Staff participants also consisted of CPOs from the regions who completed CPORF questionnaires.¹⁰ A total of 81 application questionnaires and 36 removal questionnaires regarding EM activities were completed (Table 2).¹¹ Participants who completed the application

⁷ A supervision period refers to a defined period of time in which an offender is supervised using EM.

⁸ The questionnaire was administered to a larger sample of CSC staff and PBC Board members, which were included in previous reports. The current report only examines questions specifically administered to CPOs and PO Supervisors.

⁹ Note that three respondents did not indicate their gender.

¹⁰ Though the CPORF participants represent a different sample from the staff questionnaire, it is likely that there was some overlap in participants.

¹¹ Descriptive data for individual participants are not reported. Thus, the presented descriptives are based on questionnaire responses rather than participants.

questionnaire had an average of 8 years experience as a CPO while participants who completed the removal questionnaire had an average of 8.6 years of experience as a CPO.

Table 2

CPORF Questionnaire Responses by Region

| Region | Application questionnaire (n = 81) | | Removal questionnaire (n = 36) | |
|----------|------------------------------------|----|--------------------------------|----|
| | n | % | n | % |
| Atlantic | 7 | 9 | 1 | 3 |
| Ontario | 31 | 38 | 25 | 69 |
| Pacific | 10 | 12 | 4 | 11 |
| Prairies | 6 | 7 | 1 | 3 |
| Quebec | 27 | 33 | 5 | 14 |

Note. N = 117. Ontario and Quebec accounted for the highest responses given the higher EM participation rates in these regions.

Analytical Approach

To determine the cost-effectiveness of EM, the evaluation procedures outlined by Levin and McEwan (2001) were used, which involved: (a) identifying the costs of each community supervision approach, (b) determining the effectiveness of each approach, and (c) combining the cost data with the effectiveness data to create a cost-effectiveness comparison. Supplementary analyses also included examining time spent on EM-related activities, other community supervision outcomes of interest, and other potential avenues of cost-savings. The following sections provide more detailed descriptions of the methods for each section of the report.

Matching. A matched control group of offenders was selected to provide a comparison to similar offenders in the community that were not monitored using EM. To be included as part of the control group, non-EM offenders had to meet the eligibility requirements discussed above and had to have been released between April 1, 2017 and March 31, 2018. Furthermore, casework records were used to ensure that offenders who participated in the previous EMPP were not included within the control group. The control group was established through Coarsened Exact Matching (CEM) ¹² using Stata software.

¹² CEM is described as a “Monotonic imbalance reducing matching method...[that] strictly bounds through ex ante user choice both the degree of model dependence and the average treatment effect estimation error, eliminates the

To begin the CEM process, EM participants and non-EM offenders were categorized into datasets based on their gender, Indigenous status, and sex offender status.¹³ Within each offender category, EM and non-EM offenders were matched based on the following variables: (a) region of supervision, (b) RP level, (c) supervision type, and (d) special conditions imposed.¹⁴ The strictest matching method was used to match the majority of EM and non-EM offenders. In this initial stage of matching, 65% of EM participants' profiles were matched to a comparable non-EM offender profile. For the remaining unmatched EM participants, a more generous matching process was used in order to reach a 100% matching rate.¹⁵

Time associated with EM related activities. To estimate the amount of time CPOs spend on EM related activities, results from the CPORF questionnaire (CSC, 2018b) were examined in addition to descriptive analyses on EM alert data that CPOs received.

CPORF. The CPORF working group compiled and analyzed CPO questionnaire data using an electronic survey software. CPO responses were used to obtain an average time value for each EM activity. Given that some tasks did not occur with all EM participants, the average time values were weighted to determine an activity's total number of minutes per EM supervision period.¹⁶ As such, time values specific to a limited number of instances were converted to apply to all EM supervision periods (CSC, 2018b).

Staff Experiences. To analyze the responses of CPOs and PO Supervisors from the staff questionnaire, descriptive analyses were utilized for the quantitative components while thematic coding techniques were employed for the qualitative components.

need for a separate procedure to restrict data to a common empirical support, meets the congruence principle, is robust to measurement error, works well with multiple imputation methods for missing data, can be completely automated, and is extremely fast computationally even with very large data sets" (Blackwell et al., 2010, p.1)

¹³ More specifically, offenders were subset into the following datasets: (a) Indigenous men, non-sex offenders, (b) Indigenous men, sex offenders with low/moderate Reintegration Potential, (c) Indigenous men, sex offenders with high Reintegration Potential, (d) Indigenous women, (e) Non-Indigenous men, non-sex offenders, (f) Non-Indigenous men, sex offenders with low/moderate Reintegration Potential, (g) Non-Indigenous men, sex offenders with high Reintegration Potential, (h) Non-Indigenous women.

¹⁴ The matching criteria for this study differed slightly from the previous two research reports in the study (Hanby et al., 2018; Hanby et al., 2019). Offenders were not matched on residency condition in this study in order to examine differences in residency condition imposed between the experimental and control groups.

¹⁵ In the second round of matching, a 95% matching rate was achieved by removing the variable "special conditions imposed," although all offenders in the control group had geographic restriction and/or curfew condition. To achieve a 100% match, "region" was not used for 14 Non-Indigenous men, non-sex offenders. In addition, 3 Indigenous men were matched by removing sex offender status as a matching criteria.

¹⁶ To derive an estimate of the total minutes per EM supervision period, the average completion time of an activity was multiplied by its occurrence rate (CSC, 2018b).

Alerts. For this study, data regarding alerts were extracted from the EM software and broken down at the CPO level.¹⁷ The alerts were categorized into General (global alerts) and Specific Alerts (related to conditions). General alerts were further categorized into the following categories, which is consistent with Armstrong & Freeman (2011):

- Tampering – Master tamper, BLUbox light tamper
- Interference – Shielding possible, Jamming possible
- Equipment Related – BLUbox Movement and/or Power Loss
- Battery Failure – Low battery, Critical battery, Dead battery
- Other Technical Failures – Message gap, No GPS

Specific alerts were further categorized into the following categories:

- Area Violations – Exclusion alarm, Global exclusion alarm
- Time Violations – BluBox curfew late arrive, BluBox curfew left early

A full definition of alerts and categorization is available in Appendix A. Descriptive statistics were used to illustrate the number and types of alerts that CPOs received for supervised offenders that occurred between April 1, 2017 and March 31, 2018.¹⁸

Community supervision outcomes. Comparative analyses were conducted on post-release outcomes between the EM participants and the control group. This included first suspension warrants and first revocations for EM participants and the control group during the offender's current supervision period. Suspensions and revocations were selected as the outcome measures of interest in order to evaluate the cost-effectiveness of EM.

Suspensions and revocations. Data regarding offender suspensions and revocations were extracted from OMS. All suspension warrants and revocations for EM participants and the control group during the study period were included in this study. Descriptive analyses were used to examine the frequency of suspensions and revocations amongst EM participants and the control group. Additionally, EM participants and control group offenders were compared on the reasons for suspension, as well as the outcome of those suspensions. A suspension may occur (a) when a breach of conditions has occurred, (b) to prevent a breach of conditions, or (c) to protect

¹⁷ While alerts were categorized in a similar matter in the first report (Hanby, Nelson, & Farrell-MacDonald, 2018), they were broken down at the offender level rather than at the CPO level.

¹⁸ The NMC receives incoming alerts and subsequently notifies an offender's PO as needed. Based on standardized response protocols and the circumstances surrounding the alert, POs do not follow-up or otherwise act upon all alerts.

society (i.e., risk is considered unmanageable in the community). Possible outcomes include issued, executed or withdrawn warrants, as well as cancelled or expired suspensions.¹⁹ Lastly, EM participants and the control group were compared on the frequency of suspensions related to their special conditions of curfew or geographic restrictions.

Residency conditions. The residency conditions data were extracted from OMS on a bi-weekly basis before being collated into a single database. Length of residency was calculated using the difference in days between: (a) the condition effective date or study start date (i.e., EM participant start date or non-EM participant release date), whichever came first; and (b) the condition end date or study end date (i.e., March 31, 2018), whichever came last.²⁰ Comparative analyses were used to examine the differences in rates of imposition and the length of residency conditions amongst EM participants and the non-EM offenders.

Frequency of contact. Data related to the FOC between offenders and their CPOs were extracted from OMS. FOC levels were examined at two different occasions throughout the study period. The first FOC for the EM participants represents the level of intervention determined as of the date they were placed on EM. For the control group, the first FOC represents the level determined as of the date they were released into the community. The second FOC for both groups reflect the offenders' level of intervention as of March 2018 or alternatively an offenders' last FOC if it occurred prior to this (e.g., in instances where an offender reached WED or returned to custody). Comparative analyses using Pearson chi-square were used to examine differences in the FOC between the EM participants and the control group. Analyses were performed in accordance with the criteria outlined in *Commissioner's Directive 715-1* (CSC, 2019). Thus, FOC levels with residency conditions were paired with the corresponding FOC levels without a residency condition that an offender met the criteria for. Pairings included:

¹⁹ A person with designated authority can withdraw the warrant if the warrant has not been executed (Correctional Service Canada, 2018b). If the PBC directed the suspension, the PBC must approve any withdrawal. A suspension can be cancelled under the following circumstances: (a) new information modifies the risk assessment, (b) new information modifies the reasons for the suspension, (c) a new release plan or new conditions, that are consistent with the offender's Correctional Plan, which reduce the risk to the community to an acceptable level, or (d) loss of jurisdiction due to late referral. If a charge is laid pursuant to section 753.3 of the *Criminal Code* for an offender subject to a Long Term Supervision Order (LTSO), the warrant of suspension, apprehension and recommitment expires (Correctional Service Canada, 2018b).

²⁰ This calculation accounts for the amount of time the condition should have been in place, but limits it to what was reasonable and possible based on the cut-off date. This approach was selected to compensate for the large proportion of offenders serving LTSO's, which would inflate the duration of residency periods (as condition end date may be entered as the last day of the LTSO).

- Level I (8x/month) & Level A –Residency (4x/month)
- Level A (4x/month) & Level B –Residency (2x/month)
- Level B (2x/month) & Level C –Residency (1x/month)

Cost-effectiveness. To examine the cost-effectiveness of EM relative to traditional supervision, the cost data for both approaches were combined with effectiveness data (i.e., suspensions and revocations) to produce a cost-effectiveness comparison.

Cost data. The EM project team provided data regarding the cost of EM for the 2017-2018 Fiscal Year (FY). In order to capture the tangible costs of EM, the cost information elements were grouped into three broad categories: (a) equipment and materials (e.g., EM device related costs), (b) personnel (e.g., staff salaries), and (c) other inputs (e.g., ongoing training/outreach). In addition, the Cost of Maintaining Offenders (COMO) was provided by CSC’s Finance Department.²¹ CSC prepares an annual analysis on the average cost of maintaining a federal offender. The COMO is obtained by dividing CSC’s overall operating expenses by the annual average number of offenders.²² Based on the above information, the incremental daily cost of EM (i.e., the additional cost of EM relative to traditional supervision) and the total daily cost of EM (i.e., combining the additional daily cost of EM with the daily cost of traditional supervision) were then calculated.

Cost-effectiveness ratio. Cost-effectiveness was estimated by dividing the effectiveness estimates by the cost of the program, which produces a cost-effectiveness ratio (CER).²³ However, the costs of a specific intervention (i.e., EM) need to be separated from the costs required for the baseline program (i.e., traditional supervision without the use of EM) that contains the intervention (Gies et al., 2012; Gies et al., 2013; Levin & McEwan, 2001). This entailed the consideration of additional or incremental costs and effects associated with EM. Therefore, in order to account for the baseline of traditional supervision, incremental cost-

²¹ The 2016-2017 COMO was used instead of the 2017-2018 COMO as it was not yet available at the time of writing this report. However, differences in costs between FYs was minimal. For instance, there was an overall decrease (-1.3%) in the community cost per offender from the 2015-2016 COMO to the 2016-2017 COMO. As such, we would expect that the impact on the cost analysis would be negligible.

²² The calculation of these costs is based on the Expenditures by Institution plate published in Volume III of the Public Accounts of Canada (CSC, 2018) and includes actual salaries, operating expenditures, contributions to employee benefit plans, but excluding the retroactive payments (pertaining to previous years) of salaries for newly signed collective agreements. It also excludes capital expenditures and CORCAN operational expenditures.

²³ $CER = (C/E)$, where C is the costs of the program (i.e., EM or traditional supervision) and E is the effects of the program (i.e., the proportion of suspensions/revocations).

effectiveness ratios (ICER's) were calculated. The ICER is defined as the difference in cost between the two interventions divided by the difference in their effect (i.e., differences in frequency of suspensions and revocations).²⁴ An ICER is interpreted as the cost required to obtain a single unit of effectiveness (e.g., the cost required to obtain a 1-percent increase or decrease in reoffending; Levin & McEwan, 2001). Separate ICERs were calculated for suspensions and revocations.

Cost-savings. The costs of utilizing EM and maintaining an offender in a CCC or CRF were examined to determine the potential cost-savings of EM relative to these management approaches. These analyses were based on the COMO figures for the various residency options, as well as the calculated total daily cost of EM. Given that this data is historical, actual cost-savings could not be calculated.

²⁴ $ICER = (C_1 - C_2) / (E_1 - E_2)$, where C_1 is the cost of EM and C_2 is the cost of traditional supervision and E_1 are the effects of EM and E_2 are the effects of traditional supervision (i.e., the proportion of suspensions and revocations).

Results

Utilization of EM

Description of EM participation. At the end of the follow-up period (as of March 31, 2019), there were five offenders still on active EM supervision periods (1.5% of the sample),²⁵ 151 successfully completed EM supervision periods (44.9%), and 180 EM supervision periods (53.6%) terminated early due to the offenders being removed prior to the end of their period. Collectively, this represents the 336 offenders in the EM participants group.

The average duration that POs requested to have offenders placed on EM was 149.4 days ($SD = 46.4$), with a range from four to 210 days.²⁶ Slightly more than half (65.4%) had a duration requested over 180 days, while 25.4% had a duration requested between 90 and 180 days, and 9.2% had a duration requested for less than 90 days. CPOs are able to request a maximum duration of 180 days; therefore, the higher durations represent situations in which the duration was extended while on EM. The device was worn by EM participants for an average of 139.5 days ($SD = 77.8$), with a range from three to 519 days for offenders who successfully completed their EM supervision period. Offenders who had their device removed prior to the end of their EM supervision period wore it for an average of 70.6 days ($SD = 67.5$) with a range from one to 335. Given that on average offenders were wearing their EM device for less time than was requested by their CPOs, this may suggest that offenders are potentially being removed when case management staff are satisfied with the offenders' behaviour in the community.

Of the 151 offenders that successfully completed their EM supervision period, 92 offenders (60.9%) were removed from EM upon successful completion of their full supervision period, 31 offenders (20.5%) were removed because they had reached their Warrant Expiry Date (WED), and 28 offenders (18.5%) were removed due to a decision from their case management team. Offenders who were removed from EM prior to the end of their EM supervision period were typically suspended ($n = 174$; 96.6%). Other reasons included medical reasons, death, deportation, or resulting from a union dispute ($n = 6$; 3.4%).

Comparison to control group. The sample of 336 offenders in the EM group were matched to 336 offenders in the control group. Due to the matching process, the groups were

²⁵ A supervision period refers to a defined period of time in which an offender is supervised using EM.

²⁶ 32 cases did not have a duration requested as their duration was still to be determined.

comparable in terms of gender, Indigenous status, sex offender status, region of supervision, RP level, supervision type, and special conditions. Comparisons in relevant risk and need factors indicated no significant differences between the two groups (refer to Table 3). At the time of admission to federal custody, the EM participants and non-EM offenders were comparable in terms of accountability, engagement, and responsivity. At release, EM participants appeared to have slightly lower static and dynamic risk factors and slightly lower levels of motivation than offenders in the control group. However, none of these differences reached significance. There was a significant difference between the EM participants (9.5%, $n = 32$) and the control group (3.3%, $n = 11$) in the percentage of offenders with a LTSO ($\chi^2 (1, N = 672) = 10.95, p < .001$, Cramer's $V = .13$).²⁷

²⁷ Although the EM participants had significantly more LTSO offenders, this did not have an impact when examining differences in the frequency of suspensions and revocations between the two groups.

Table 3

Risk and Need Characteristics of EM Participants and Control Group

| Characteristic | Percentage (n) of offenders | | Cramer's |
|-------------------------------|-----------------------------|-------------------------|----------|
| | EM participants (n = 336) | Control group (n = 336) | V |
| Accountability (at intake) | | | .03 |
| Low | 26.5 (89) | 28.3 (95) | |
| Moderate | 68.2 (229) | 67.3 (226) | |
| High | 5.4 (18) | 4.5 (15) | |
| Engagement (at intake) | | | .02 |
| No | 29.8 (100) | 31.3 (105) | |
| Yes | 70.2 (236) | 68.8 (231) | |
| Responsivity (at intake) | | | .04 |
| No | 81.3 (273) | 77.7 (261) | |
| Yes | 18.8 (63) | 22.3 (75) | |
| Static factor (at release) | | | .04 |
| Low | 2.7 (9) | 1.8 (6) | |
| Moderate | 34.8 (117) | 33.0 (111) | |
| High | 62.5 (210) | 65.2 (219) | |
| Dynamic factor (at release) | | | .08 |
| Low | 1.2 (4) | 0.3 (1) | |
| Moderate | 29.5 (99) | 24.7 (83) | |
| High | 69.3 (233) | 75.0 (252) | |
| Motivation level (at release) | | | .03 |
| Low | 25.3 (85) | 24.7 (83) | |
| Moderate | 62.5 (210) | 61.3 (206) | |
| High | 12.2 (41) | 14.0 (47) | |

Time Associated with EM Related Activities

CPORF questionnaires.²⁸ Considering the results from both questionnaires, on average CPOs spent 8.8 hours (527.9 minutes) per EM supervision period on both application and removal processes. As demonstrated in Table 4 and based on the results of the application questionnaire, the average total time CPOs spent on application processes was 234.1 minutes per EM supervision period, or approximately 3.9 hours. Pre-acceptance activities accounted for 40 minutes and represented 17.1% of the total application time of the EM device. These activities include consultations with the PO Supervisor, completing and sending an EM referral, as well as in some instances, time to consult with Community-Based Residential Facility (CBRF)²⁹ Directors. Pre-activation activities accounted for only 1.6% of the time identified in the application questionnaire and represent instances that require time to complete and send a device field-test form.³⁰ Of the activities identified in the questionnaire, CPOs appeared to have spent the most time on pre-application processes, accounting for 104.5 minutes per EM supervision period (44.6%). The pre-application activities encompass a range of tasks such as equipment testing, the identification and communication of geographic zones and schedules, as well as time for reviewing the offender instruction form. Application activities, which largely involve the technical aspects of EM application, accounted for 28.2% of the time identified in the application questionnaire (66.1 minutes per EM supervision period). Application activities include the time required for the CPOs to apply an EM device, install the EM Radio Frequency (RF) unit, explain the equipment to the offender, as well as complete other casework record documentation. Accounting for 19.6 minutes (8.4%) was other EM-related activities, which capture the additional EM tasks that CPOs may carry out, such as communications with the EM Project Team at National Headquarters or the clearing of alerts.

²⁸ The reported times in this section pertaining to the CPORF questionnaires were obtained directly from the report titled *Electronic Monitoring: Determining a Time Value for the Community Parole Officer Resource Formula* (CSC, 2018b).

²⁹ CBRFs are a designated facility that provides accommodation to offenders on parole, statutory release, temporary absence or LTSO. This includes CCCs, CRFs, and other facilities designated as CBRFs (CSC, 2019).

³⁰ A device field-test form is completed in instances where POs test the functionality of EM devices in locations where cell coverages may be a problem.

Table 4

Average Time Parole Officers Spent on Application and Removal Activities

| Activity | <i>M</i> |
|---|--------------|
| Application | 234.1 |
| Pre-acceptance activities | 40.0 |
| Pre-activation activities | 3.8 |
| Pre-application activities | 104.5 |
| Application activities | 66.1 |
| Other EM-related activities | 19.6 |
| Removal | 293.9 |
| Analysis / monitoring of EM data activities | 136.3 |
| Removal activities | 100.3 |
| Post-removal activities | 39.8 |
| Other EM-related activities | 17.5 |

Note. *M* = mean number of minutes per EM supervision period. See Appendix B for a detailed breakdown of the application and removal activities and their associated time calculations.

Considering the overall results of the EM application questionnaire, on average, CPOs spent 59.8 minutes more on removal activities that were identified in the removal questionnaire than they did on the application activities. The total time for activities related to the removal processes was 293.9 minutes per EM period, or approximately 4.9 hours. Based on the responses, the analysis and monitoring of EM data activities took CPOs the most time compared to all other activities identified in the removal questionnaire. CPOs on average spent 136.3 minutes per EM supervision period on monitoring EM data activities, which is equivalent to 46.4% of the total time identified in the removal questionnaire. Monitoring of EM data activities includes reassessing an offender's risk, responding to alerts, inspecting the EM device and straps, as well as reapplying an EM device. Removal activities comprise 34.1% of total time identified in the removal questionnaire, accounting for an average of 100.3 minutes. These activities include a range of tasks, such as case conferencing with PO Supervisors regarding removal decisions, the physical removal of an EM device, as well as the time required for documenting removal reasons in the casework record. Post-removal activities involving the time CPOs require

for retrieving EM equipment from the offender took on average 39.8 minutes (13.5%). Other related activities accounted for an average of only 17.5 minutes or 6.0% of the total time identified in the removal questionnaire. Amongst various tasks, CPOs identified other activities to encompass discussions with offenders regarding the EM device or the replacement process of an RF unit.

As expected, these findings indicate that there is additional staff time associated with monitoring an offender using EM. With the application and removal questionnaires administered under the pilot phase of EM and shortly after its implementation, this may have partially affected the resulting average times. Many of the CPOs may have had limited experience or familiarity with the EM technology and its associated procedures, which may have led to lengthier completion times. With further exposure, CPOs may become more acquainted in dealing with arising technical issues related to the technology or alternatively become more efficient with the completion of forms and casework records related to EM. As such, as CPOs become more familiar with EM-related tasks and acquire more experience in the application and removal processes of EM, the time spent completing the associated activities is expected to decrease (CSC, 2018b). Furthermore, as best practices were developed regarding common technological issues over the course of the pilot, CPO time associated with EM monitoring may also decrease.

Staff perceptions on EM experience. As a part of the staff questionnaire, CPOs and PO Supervisors were asked to comment about their experience of working with EM. Of the CPOs with EM experience, 72.8% reported that they agree or strongly agree that the availability of EM has changed the volume of work required for their position. Only 20.1% either disagreed or strongly disagreed, in comparison to 7.1% who were undecided. Further to this, 68.6% of CPOs agreed or strongly agreed that the availability of EM changed the amount of time spent on case management. As indicated by staff responses, the availability of EM appears to have affected the work volume for PO Supervisors less than it has for CPOs. Just over half of PO Supervisors indicated that the availability of EM has changed the volume of work required for their position (55.0%). While the availability of EM appears to have changed the volume of work, EM does not appear to have affected the amount of after-hours work required for CPOs and PO Supervisors. Of the CPOs and PO Supervisors with EM experience, only 30.8% and 14.6% respectively agreed or strongly agreed that EM changes the amount of after-hours work.

Questionnaires provided an opportunity for respondents to share challenges associated

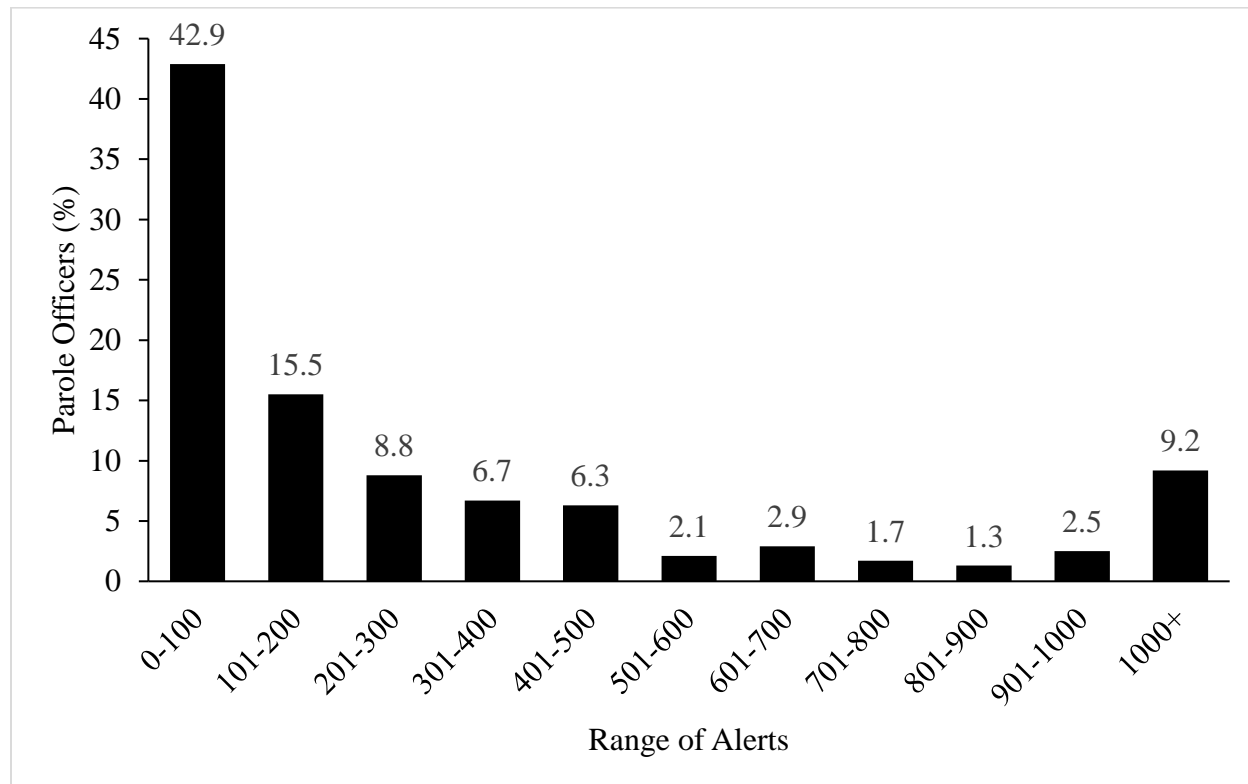
with EM as well as considerations as to how these issues may be resolved. The major emerging theme from the responses of the staff related to the time associated with supervising an offender on EM. Notably, many of the CPOs and PO Supervisors expressed that EM includes additional work and more time than is typically required for supervising offenders. Some respondents made mention to the substantial number of emails that are generated from having offenders under EM supervision while others made note of the application and removal processes associated with EM, including the time that is required communicating the nuances of EM to offenders throughout the supervision period. In response to this noted challenge, the most common recommendation emerging from the responses of the staff, particularly the CPOs, is that the time associated with supervising offenders under EM needs to be recognized or accounted for in the CPORF. Despite the additional workload and time associated with EM, staff highlighted the responsivity and integral support of the NMC staff and the EM project team to any arising concerns throughout EM supervision periods.

Number and types of alerts. Descriptive statistics were used to capture the nature and type of alerts POs received between April 1, 2017 and March 31, 2018.³¹ With the range of different alerts viewed collectively, on average a CPO received 344 ($SD = 542.83$) alerts per offender during their supervision period. However, as demonstrated in Figure 1 the majority of CPOs ($N = 102$) received under 100 alerts. While the NMC notifies CPOs of all incoming alerts for offenders under EM supervision, the process CPOs undergo for following up varies depending on the circumstances of the alert. While the NMC is responsible for monitoring activities and responding to alerts, some alerts may require little to no CPO follow up. This is particularly the case in the occurrence of a false alert, such as an accidental BLUbox movement. Other alerts, such as low battery, may require a short follow-up procedure, such as a phone call reminder or meeting with the offender. Importantly however, alerts that are higher risk entail more stringent follow-up procedures. Pursuant with policy (CSC, 2016), circumstances involving deliberate tampering with an EM device require that CPOs conduct a reassessment of risk, which subsequently may result in the modification, suspension, or termination of an offender's release (CSC, 2016). As such, while CPOs receive a range of alerts, the subsequent follow-up procedure

³¹ The NMC receives incoming alerts and subsequently notifies an offender's PO as needed. Based on standardized response protocols and the circumstances surrounding the alert, POs do not follow-up or otherwise act upon all alerts.

and associated time is largely dependent on both the type of alert as well as its surrounding circumstances.

Figure 1. Range of Alerts Received by Parole Officers per EM Supervision Period.



As shown in Table 5, there were more general alerts than there were specific alerts that related to an offender's supervision conditions. In particular, equipment related alerts were the most common type of alert received ($M = 182.7$, $SD = 441.4$), with *BLUbox Movement* accounting for the vast majority of these alerts. The sensitivity of the BLUbox RF unit to movement, vibrations, and to conditions of the surrounding environment may have contributed to the frequent occurrence of this alert. Other equipment related alerts including *BLUbox Power Loss* and *BLUbox Power Loss/Movement* occurred less often as they are only signalled when the RF unit losses power. While such alerts may result from the unplugging of the RF unit, they may also be caused unintentionally via a power outage.

Though equipment related alerts encompassed the majority of general alerts, other technical alerts also occurred frequently ($M = 61.3$, $SD = 85.1$). Prompted when cellular

communication is lost between an offender's device and the EM system for a period of two hours, *Message Gap* alerts were often received by POs. *No GPS* is another technical alert frequently received, as compromised GPS signals may trigger this alert, such as underground spaces. General alerts that occurred much less often include battery failure ($M = 13.3$, $SD = 22.6$), tampering ($M = 4.5$, $SD = 4.7$) and interference ($M = .8$, $SD = 5.7$) alerts. Specific to battery failure, *Low Battery* alerts comprised the majority of alerts that POs received. This occurrence is expected given that low battery alerts are activated to signal 10 hours of charge remaining on an offender's EM device. With the threshold of *Critical Battery* alerts and *Dead Battery* alerts being much higher—four hours of charge remaining and 30 minutes of charge remaining respectively, these alerts did not occur as often.

Occurring less frequently than battery failure alerts were tampering alerts, which despite being less common, may be considered more serious. *Master Tamper* alerts are prompted when the strap attached to an offender's EM device has been cut, removed, or otherwise tampered with. While this alert may signify an offender's deliberate tampering or intentional removal of the EM device, it may also result from procedural issues, such as the inspection of the device by police or its removal for medical reasons. A *Master Tamper* alert may also arise from technical issues caused from the precise interference of water with the internal fiber optics of the EM device. Given the potential sources that may signal a *Master Tamper* alert, it is unclear how many of the observed alerts were the result of deliberate tampering. Interference alerts, including *Shielding Possible* and *Jamming Possible* were the least frequently occurring general alerts. *Shielding Possible* alerts account for the majority of interference alerts, as they occur when an offender's EM device detects the presence of metal that is obstructing communication with the EM system. In contrast, *Jamming Possible* alerts are only promoted upon the detection of a jamming device, and thus did not occur as often.

Table 5

Nature and Types of Alerts Received by Parole Officers

| Nature of alert | Type of alert | Alert | Total <i>n</i> Alerts | <i>M</i> Alerts/ Parole Officer | <i>SD</i> |
|-----------------|------------------------------------|--------------------------------|--------------------------|------------------------------------|--------------|
| Specific | | | 19,376 | 81.4 | 177.0 |
| | Area violations^a | | 4,373 | 18.4 | 50.2 |
| | | Global exclusion alarm | 2,525 | 10.6 | 40.8 |
| | | Exclusion alarm | 1,848 | 7.8 | 21.8 |
| | Time violations^b | | 15,003 | 63.0 | 171.6 |
| | | BLUbox early curfew | 13,373 | 56.2 | 164.3 |
| General | | BLUbox late curfew | 1,630 | 6.9 | 14.0 |
| | | | 62,472 | 262.5 | 474.5 |
| | Equipment | | 43,486 | 182.7 | 441.4 |
| | | BLUbox movement | 36,136 | 151.8 | 413.9 |
| | | BLUbox power loss | 3,258 | 13.7 | 34.3 |
| | | BLUbox power loss/ movement | 4,092 | 17.2 | 77.9 |
| | Other technical | | 14,578 | 61.3 | 85.1 |
| | | No GPS | 6,424 | 27.0 | 50.7 |
| | | Message gap | 8,154 | 34.3 | 53.0 |
| | Battery failure | | 3,157 | 13.3 | 22.6 |
| | | Low battery alarm | 2,585 | 10.9 | 18.5 |
| | | Critical battery | 372 | 1.6 | 3.9 |
| | | Dead battery | 200 | .84 | 2.2 |
| | Tampering | | 1,072 | 4.5 | 4.7 |
| | | Master tamper | 1,071 | 4.5 | 4.7 |
| | | BLUbox light tamper | 1 | .0 | .07 |
| | Interference | | 179 | .8 | 5.7 |
| | | Shielding Possible | 169 | .7 | 5.7 |
| | | Jamming Possible | 10 | .04 | 0.5 |

Note. Alerts do not represent unique occurrences. Therefore, it is possible that a PO received multiple alerts for a single occurrence involving the same offender. The total number of EM offenders on a PO's caseload with alerts ranged from 1 to 11 offenders, with 55.5% of parole officers having only 1 offender.

^a Absence of available data for *Inclusion Alarm- supervision zone*.

^b Absence of available data for *Inclusion Alarm- curfew*.

Considering the range of circumstances that may trigger general alerts, specific alerts related to an offender's supervision conditions occurred less often, though were still common. These alerts are important to consider as they are those that would require additional PO time to respond to. Specific alerts are sensitive to time violations related to curfew conditions as well as geographic area violations. Time violations accounted for the majority of specific alerts received ($M = 63$, $SD = 171.6$). In the event an offender leaves their residence early while their curfew hours are still in effect, this signals a *BLUbox Early Curfew* alert. This time violation alert occurred much more frequently than the contrasting time violation of *BLUbox Late Curfew*, which occurs when an offender arrives late after curfew hours are already in effect. Though not regarded as a breach of condition, instances where offenders left or arrived five minutes outside of their curfew hours would have nonetheless still signalled an alert. With time violation alerts attuned to an offender's specific curfew conditions, frequent time violations are expected.

Occurring less often than time violation alerts are area violation alerts related to imposed geographic conditions ($M = 18.4$, $SD = 50.2$). *Global Exclusion Alarm* accounted for the majority of area violation alerts and are promoted when an offender enters into an exclusion zone identified as a children's area, such as a park or school. Occurring less often were *Exclusion Alarms* triggered when an offender enters an exclusion zone. Though area violation alerts may signify a breach of condition, an offender's exclusion zone is often not amended for short travel permits and thus, may occur in instances where an offender has been authorized for travelling.

Community Supervision Outcomes

Suspensions. There were no significant differences between the EM participants and the control group in the number of offenders suspended during the study period ($\chi^2(1, N = 672) = 3.61$, $p = .06$). Although EM participants had slightly more release suspensions than the control group (64.9% versus 57.7%, respectively), EM participants were equally likely to have those suspensions cancelled, expired or withdrawn (43.1% versus 44.3%, respectively).

There were also no significant differences between the two groups in the reasons for suspensions (see Table 6). A suspension may occur (a) when a breach of conditions has occurred, (b) to prevent a breach of conditions, or (c) to protect society (i.e., risk is considered unmanageable in the community). EM participants had a greater proportion of suspensions related to protect society, whereas the control group had a greater proportion of suspensions due

to a breach or to prevent a breach. The majority of suspensions for both the EM participants and the control group were not related to their special conditions of curfew or geographic restrictions. Among the EM participant group, 8.7% ($n = 19$) violated their curfew condition, 3.7% ($n = 8$) violated their geographic condition and 1.4% ($n = 3$) violated both. Among the control group, 5.2% ($n = 10$) violated their curfew condition, 1.5% ($n = 3$) violated their geographic condition and 1.5% ($n = 3$) violated both.

Table 6

Comparison of Suspensions and Reasons for Suspension Between Groups

| | Percentage (n) of Offenders | |
|----------------------|---------------------------------|-----------------------------|
| | EM participants ($n = 336$) | Control group ($n = 336$) |
| Suspensions | 64.9 (218) | 57.7 (194) |
| Breach term | 55.5 (121) | 59.3 (115) |
| Prevent breach | 6.4 (14) | 8.8 (17) |
| Protect society | 38.1 (60) | 31.4 (61) |
| Automatic suspension | - - | 0.5 (1) |

Note. An automatic suspension occurs when an offender who is on parole or statutory release receives an additional sentence other than a conditional or intermittent sentence.

Revocations. 24.4% ($n = 82$) EM participants had their conditional releases revoked while on EM in comparison to 21.4% ($n = 72$) offenders in the control group who were revoked while on conditional release (see Table 7); however, this difference was not significant ($\chi^2(1, N = 672) = .84, p = .359$). For both groups, the majority of revocations were without an offence, and a small percentage were revocations with an offence or an outstanding charge. The mean number of days to return to custody also did not significantly differ between groups, with 248.6 days ($SD = 143.7$) for the EM participants and 240.8 days ($SD = 127.4$) for the control group ($t(53) = 0.36, p = .723$).

Table 7

Comparison of Revocations and Types of Revocations Between Groups

| | Percentage (<i>n</i>) of offenders | |
|------------------------------------|--------------------------------------|---------------------------------|
| | EM participants (<i>n</i> = 336) | Control group (<i>n</i> = 336) |
| No revocation | 75.6 (254) | 78.6 (264) |
| Revocation without offence | 19.0 (64) | 16.1 (54) |
| Revocation with outstanding charge | 3.0 (10) | 1.2 (4) |
| Revocation with offence | 2.4 (8) | 3.0 (10) |
| Conditional release inoperative | - - | 1.2 (4) |

Note. Conditional Release Inoperative occurs when an offender who is on conditional release receives an additional sentence for an offence under a federal act, and the day on which the offender is eligible for parole is later than the day he/she receives the additional sentence, the parole becomes inoperative and the offender shall be re-incarcerated.

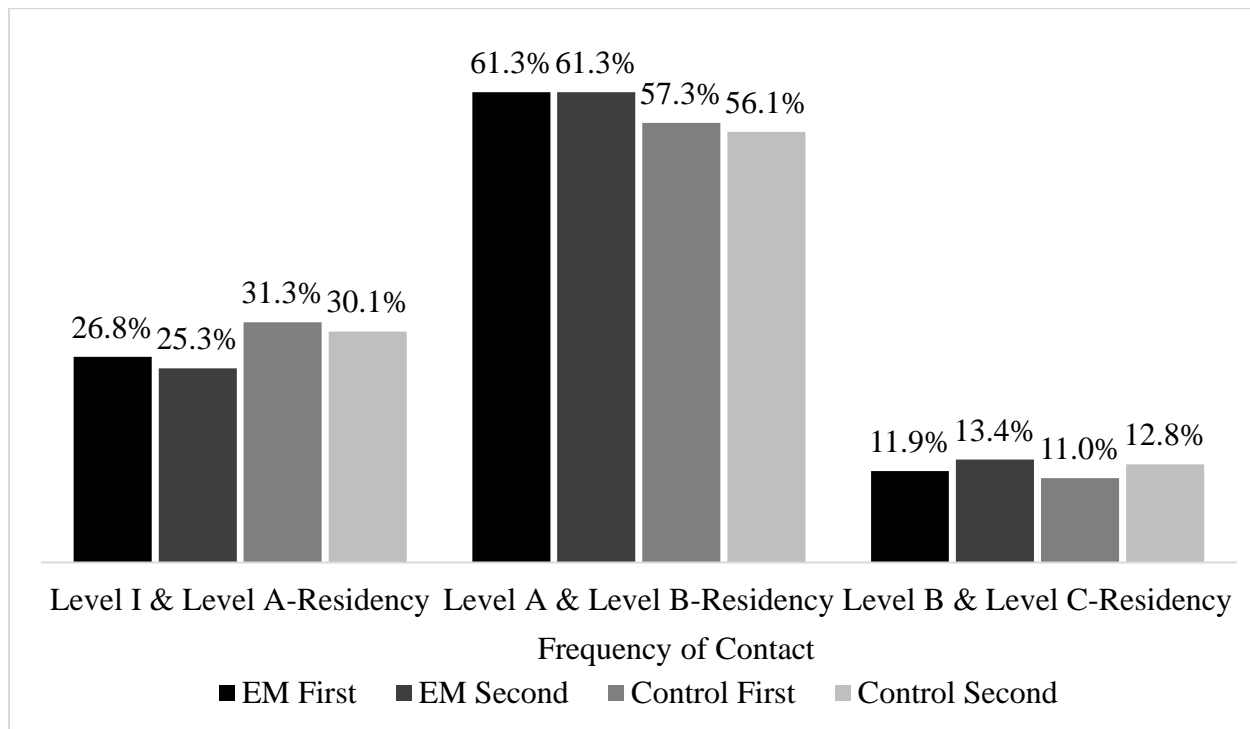
Residency. Of the 336 EM participants, 26.8% (*n* = 90) had a residency condition, compared to 46.4% (*n* = 156) of the control group. This difference reached significance ($\chi^2(1, N = 672) = 29.04, p < .001$). There was also a significant difference in the duration of residency between the two groups ($t(244) = 2.27, p = .024$), where the mean duration of residency was longer for the EM participants ($M = 333.4, SD = 189.4$), when compared to the control group ($M = 279.3, SD = 174.8$). The results indicate that although the use of EM did not reduce the length of residency for the EM participants, the imposition of residency conditions was lower for the EM participant group.

Frequency of contact. To further examine community supervision outcomes, analyses were performed comparing the FOC levels of EM participants and the control group.³² Figure 2 illustrates a comparison of EM participants and the control group for both the first and second FOC levels.³³

³² FOC levels are grouped in accordance with the criteria outlined in CD 715-1 (CSC, 2019). Level C, Level D and Level E are excluded given that few to no offenders had a FOC set at these levels (cell count less than 5).

³³ The first FOC for the EM participants represents the level of intervention determined as of the date they were placed on EM. For the control group, the first FOC represents the level determined as of the date they were released into the community. The second FOC for both groups reflect the offenders' level of as of March 2018, or alternatively an offenders' last FOC if it occurred prior to this

Figure 2. Frequency of Contact (FOC) Between EM Participants and Control Group



In assessing the difference between EM participants and the control group, chi-square analyses yielded no significant differences between the two groups at both the first FOC ($\chi^2(1, N = 670) = 1.76, p = .415$, Cramer's $V = .05$) and the last FOC ($\chi^2(1, N = 668) = 2.22, p = .330$, Cramer's $V = .06$). As such, the results suggest that the use of EM does not influence the FOC between POs and offenders during community supervision. Additionally, the distribution of offenders within the levels appears to have remained stable over time for each group. However, an extended timeframe that more expansively captures the progress of offenders in the community may have yielded notable changes in FOC levels within each group.

Cost- Effectiveness

Cost-effectiveness analyses were performed to determine which community supervision approach (i.e., EM or traditional supervision) provided the most effective outcomes at the lowest cost. In particular, the costs of each community supervision approach were identified, which was then combined with the outcome data to create a cost-effectiveness comparison.

Costs of community supervision approaches. Table 8 provides a breakdown of the cost

for the various tangible elements associated with EM. The personnel category was estimated by obtaining the expenditures on EM project staff salaries and NMC staff salaries.³⁴ The equipment and materials category included EM device related costs such as supplies, services, monitoring fees, and lost/damaged equipment. The other inputs category included ongoing training and outreach as well as other administrative costs.

Overall, the total EM program expenditures for the 2017-2018 FY were \$1,444,105.38. This amount represents the additional costs of EM relative to traditional supervision.³⁵ However, not all of the EM participants wore the device for the full study period (e.g., early removal due to suspension or revocation, Case Management Team decision). During the study period, 336 offenders had an active EM device for at least one day. To account for the variable rate of devices being used, the total number of days that the devices were active was calculated based on the dates when the offender was placed on EM and when it was removed or the end of the study period (i.e., March 31, 2019). This amounts to an average of 100 offenders concurrently active each day.³⁶ Based on the total EM program expenditures for the FY (\$1,444,105.38), the average daily cost per offender on EM was \$39.46 in addition to the regular costs associated with traditional supervision.³⁷ The comparative daily cost of traditional supervision per offender was \$45.39; therefore, the average daily cost per offender on EM was \$84.85.

³⁴ This calculation included contributions to employee benefit plans (EBP).

³⁵ As outlined in the methods section, the cost of maintaining an offender is obtained by dividing CSC's overall operating expenses by the annual average number of offenders. Therefore, based on the number of non-EM offenders during the study period ($n = 336$), the total annual expenditures for traditional supervision were \$5,566,766.61.

³⁶ To determine the average number of offenders active on EM each day, the total days wearing (36,598) was divided by 365.

³⁷ The average daily amount per EM offender was calculated by taking the incremental yearly cost of EM (\$1,444,105.38) and dividing it by the total number of days wearing (36,598). This resulted in an additional cost of \$39.46 per EM offender per day.

Table 8

EM Cost Data for 2017-2018

| Cost category and elements | Cost (\$) |
|---|---------------------|
| Personnel | 873,684.38 |
| EM project team salary | 400,325.78 |
| NMC staff salary | 473,358.60 |
| Equipment and materials | 558,185.78 |
| Device rentals | 520,765.78 |
| Supplies | 21,918.00 |
| Lost/damaged equipment | 15,502.00 |
| Other inputs | 12,235.22 |
| Ongoing training/outreach | 11,485.22 |
| Other administrative costs | 750.00 |
| Total EM program expenditures | 1,444,105.38 |
| Additional daily cost (per EM participant) | 39.46 |
| Total daily cost (per EM participant) | 84.85 |

Incremental cost-effectiveness ratio. To calculate the ICER's, the difference in cost between EM and traditional supervision (i.e., incremental costs) were divided by the difference in their effects (i.e., differences in frequency of suspensions and revocations). Separate ICER's were calculated for each outcome. The average daily cost of EM is \$84.85 while the average daily cost of traditional supervision is \$45.39, a daily difference of \$39.46. In addition, there was a 7.2% difference in the rate of suspensions between the EM participants and the control group and a 3.0% difference in the rate of revocations between the two groups. Table 9 displays the ICER's for each of the outcomes. An ICER of 5.48 indicates that compared with traditional supervision, EM costs \$5.48 per day per offender to obtain a 1% increase in suspensions. Similarly, EM costs \$13.15 per day per offender to obtain a 1% increase in revocations.

Table 9

Incremental Cost-Effectiveness Analyses

| Outcome | EM participants (%) | Control group (%) | Difference (%) | ICER |
|-------------|---------------------|-------------------|----------------|-------|
| Suspensions | 64.9 | 57.7 | 7.2 | 5.48 |
| Revocations | 24.4 | 21.4 | 3.0 | 13.15 |

Note. Effectiveness estimates were obtained from the outcome analyses in the previous section.

Cost-savings of EM

In the current sample, EM participants were significantly less likely to have a residency condition imposed (26.8% of the EM participants, compared to 46.4% of the non-EM offenders). Based on the COMO, the average annual cost to maintain an offender in a CCC is \$61,231 (average daily rate of \$167.76) and to maintain an offender in a CRF is \$61,818 (average daily rate of \$169.36). In comparison, the anticipated average annual cost of supervising an offender in the community on EM without a residency condition is \$30,987 (average daily rate of \$84.85). This may result in potential cost-savings if offenders for whom a residency condition would otherwise be imposed were instead supervised in the community with EM. It is important to note that the Parole Board of Canada makes the decision for a residency condition.

Staff perceptions on cost-effectiveness of EM. As a part of the staff questionnaire, CPOs and PO Supervisors were given the opportunity to provide their thoughts on the cost-effectiveness of EM. Consistent with the results, the majority of respondents indicated that they perceived EM as being less costly than residency (71.5%, $n = 171$), while just over half reported EM to be less costly than onsite verifications (54.8%, $n = 131$). However, most CPOs and PO Supervisors (33.3%, $n = 80$) regarded EM as being more costly than telephone verifications, while only 19.6% ($n = 47$) perceived EM to be less costly. Additionally, compared to increasing an offender's level of intervention concerning FOC, 35.6% ($n = 85$) reported EM to be less costly, while only 12.1% ($n = 29$) reported EM to be more costly. Similarly, 36.9% ($n = 89$) of respondents regarded EM as being less costly than the use of reporting centres compared to 9.1% ($n = 22$) who perceived EM as more costly than the use of reporting centres³⁸. Overall, the responses of CPOs and PO supervisors appear to suggest that EM may be considered relatively more cost-effective than other supervision tools or intervention strategies.

³⁸ Reporting centres provide increased supervision for offenders through additional support and monitoring.

Discussion

As part of a larger EM Research Pilot, this supplementary report examined the cost-effectiveness of EM compared to traditional supervision. In the context of EM as an additional discretionary supervision tool, the results did not support EM as a cost-effective approach in reducing recidivism compared to traditional supervision. In particular, EM was more expensive and equally as effective compared to traditional supervision in recidivism outcomes, as there were no significant differences in suspensions and revocations between the two groups. However, EM may demonstrate potential cost-savings compared to the costs of maintaining an offender in a CCC or CRF if offenders for whom a residency condition would otherwise be imposed were instead supervised in the community with EM.

An analysis of various sources (CPORF questionnaires, staff questionnaires, and the number and types of alerts generated) revealed that EM supervision appears to be associated with substantial additional time requirements from POs. This can be attributed to the associated application and removal processes, which involved close to nine hours per EM period. Additionally, through the examination of EM-related alerts, POs receive and respond to various alerts throughout the supervision period, with the majority encompassing general alerts not related to the supervision conditions of offenders. In particular, equipment related alerts appear to occur most frequently. Despite the additional workload associated with EM-related activities, it is evident that a number of CPOs see the value of EM as they continue to use this discretionary tool. However, the most common recommendation emerging from the responses of the staff is that the time associated with supervising offenders under EM needs to be recognized or accounted for in the CPORF.

In order to assess the cost-effectiveness of EM, it was first necessary to quantify the differences in community supervision outcomes between groups. It should be noted that there were no statistically significant differences between the EM participants and non-EM offenders in any of the suspension or revocation analyses. The EM participants were slightly more likely to be suspended during their supervision than the control group; however, this difference was not significant. EM participants and the control group were equally likely to have suspensions cancelled, expired or withdrawn. EM participants had a greater proportion of suspensions to protect society, but a smaller proportion of suspensions due to a breach or to prevent a breach.

Lastly, the majority of suspensions for both the EM participants and the control group were not related to their special conditions of curfew or geographic restrictions. Similar to the previous study encompassing the full sample (Hanby et al., 2019), EM participants had equal revocations with or without an offence compared to non-EM offenders.

In terms of other community supervision characteristics, EM participants were significantly less likely to have a residency condition imposed. However, the mean duration of residency periods were significantly higher for EM participants. An analysis of the levels of FOC between the two groups revealed no significant differences. Additionally, the distribution of offenders within the FOC levels appears to have remained stable over time for each group. These results suggest that the use of EM does not influence the FOC between CPOs and offenders during community supervision. As one part of the cost-effectiveness analyses, this report compared the cost of EM to traditional supervision, demonstrating that EM was more expensive than supervision without the use of EM. However, this was expected given that the focus was on evaluating the additional costs of EM over traditional supervision. With respect to outcomes, although not significant, the EM participants had slightly more suspensions and revocations compared to the control group. Combining the cost data with the outcome data, results from the cost-effectiveness analyses suggest that EM is more expensive and equally as effective as traditional supervision in terms of reducing suspensions and revocations. Although EM is more expensive compared to monitoring an offender in the community without EM, EM may demonstrate potential cost-savings compared to the costs of maintaining an offender in a CCC or CRF if offenders for whom a residency condition would otherwise be imposed were instead supervised in the community with EM.

Staff perceptions on the cost-effectiveness of EM demonstrated that the majority of respondents indicated that EM was less costly than residency, onsite verification, increased level of intervention, and increased police reporting. However, respondents indicated that EM was considered more costly than telephone verification. Lastly, the responses regarding the use of a reporting centre were divided, where some indicated EM was less costly and others reported that they were unsure.

Conclusions

Previous studies of the cost-effectiveness of EM often evaluate EM as an alternative to

incarceration, showing incarceration to be around five or six times more expensive (Bales et al., 2010). While EM has been shown to be less expensive than incarceration, CSC uses EM as a supervision tool intended to compliment traditional supervision; EM is not an alternative to incarceration. Thus, analyses in this report were mainly limited to comparing the costs associated with traditional supervision to supervision with EM. Therefore, the manner in which EM is used within an organization directly impacts how cost-analyses are conducted as well as what comparisons can be made.

Not surprisingly, it costs more to supervise a client in the community with EM than without (Omori & Turner, 2015). This report selected a narrow cost-effectiveness approach, which focused on the direct, tangible costs associated with EM (e.g., salary and EM equipment). While this approach is more straightforward as it is based on information that feasibly can be gathered and represented in dollar amounts, this method omits a number of other cost information and considerations. A one-year snapshot of EM operations was utilized; therefore, the costs were restricted to ongoing costs and not initial costs, such as investments in the planning process for incorporating EM into existing correctional options and start-up costs associated with the monitoring centre. Further, time spent on EM-related activities was estimated and discussed in the current report, but a financial cost was not allocated to the time POs spend on EM related activity.

The cost-effectiveness methodology selected was also narrow in its measure of effectiveness in terms of suspensions and revocations of release. Utilizing this narrow measure, EM was not found to be a cost-effective measure in reducing recidivism. These findings are inconsistent with the few previous studies that have examined EM as a supervision tool in comparison to traditional supervision and found that the EM program was more expensive yet more effective in reducing recidivism in terms of arrests (Gies et al., 2012; Gies et al., 2013). In the second study of this research pilot, once controlling for other factors (e.g., security level at release, Criminal Risk Index level), EM participants had a lower risk of return to custody. EM participants spent a longer period of time in the community prior to their first suspension or revocation. The findings from the previous study encompassing the full sample of EM participants and a more sophisticated measure of differences (i.e., survival analysis) indicate that the use of EM may be associated with reductions in recidivism. While such analyses were beyond the scope of the current report, they do suggest that comparisons using simple

percentages may fail to capture differences between EM participants and non-EM offenders. In the previous study, more positive community supervision outcomes were also observed with certain offenders; namely offenders with a geographic restriction or both a geographic restriction and curfew (Hanby et al., 2019). From a cost-effectiveness approach, findings that are more positive may emerge if the use of EM was restricted to these groups.

Potential cost-savings were observed in the current study when comparing EM to maintaining an offender in a CCC or CRF. However, this study did not calculate the actual cost-savings that resulted from the use of EM for offenders residing in the community without a residency condition, nor as an alternative to suspensions and/or revocations (i.e., cost per successful day in the community). EM participants were significantly less likely to have a residency condition imposed compared to the non-EM offenders (27% vs. 46%, respectively). If the differences in residency condition were attributed to the use of EM, this represents substantial cost-savings per offender. Further, results from the first study demonstrated that EM is often mentioned in offender suspension documents as a part of a post-cancellation release plan or supervision strategy (Hanby et al., 2018). If EM is used as an alternative to a suspension, it may potentially reduce costs and allow the offender to remain in the community and continue their reintegration (CSC, 2009). Capturing these intricate or otherwise intangible costs was beyond the scope of this study and the available data, but is an area that warrants further examination. By considering potential savings that may stem from having offenders supervised with EM, perhaps more positive cost-effectiveness results may be demonstrated. Further, maintaining release in the community using EM has been argued to result in fewer ‘social costs’ than prisons as offenders are better able to retain valuable family and community ties by remaining at home (Bartels & Martinovic, 2017).

As discussed in the second study of this research pilot, it has been argued that the effectiveness of EM needs to be measured not only in terms of recidivism (Hanby et al., 2019). While recidivism is a standard outcome measure in correctional research, the goal of the intervention or program should be considered. EM is a supervision tool; a tactic that provides additional information about where offenders were at certain times and whether they were home when they were supposed to be. Given that many EM programs may have multiple objectives, an EM program should not necessarily be discontinued solely on the basis of it not having a desirable effect on recidivism (Avdija & Lee, 2014). For instance, the use of EM as one part of

the community strategy may contribute to the cognitive transformations that occur in the desistance process (DeMichele, 2014). A noted advantage of EM is that it provides POs and other parole staff with valuable information about an offender's movements and thus, a greater understanding of their attitude to behavioural change (DeMichele & Payne, 2009). From the perspective of the offender, it gives them the opportunity to build credibility by demonstrating accountability and compliance with conditions (Hanby et al., 2019). It has been hypothesized that monitoring movement through EM and holding individuals accountable to a set schedule can help provide structure that may reinforce better lifestyle habits (DeMichele & Payne, 2009). Therefore, the use of EM may help offenders to control their impulses and make better decisions (Yeh, 2010). Placing a monetary value or cost savings on such offender change and desistance outcomes would clearly be difficult.

From the perspective of staff, despite an increase in workload, EM offers numerous advantages to case management and supervision approaches (Hanby et al., 2018, Hanby et al., 2019). There may also be wider economic benefits associated with the use of EM as a supervision tool that were not accounted for in the current study. Government savings are achievable through the possible continuation of an offender's employment in the community and their ability to pay taxes (Martinovic, 2016). In the second study, the use of EM demonstrated positive impacts on community employment in that EM participants were more likely to be employed and for longer periods than the non-EM offenders (Hanby et al., 2019). If an offender is employed and can continue to pay taxes, there is a reduced possibility of government assistance funds being needed for them or their family (DeMichele & Payne, 2009).

These impacts collectively highlight the value that may be derived from EM beyond that of recidivism. It is important to understand the capabilities and limitations of EM, in order to establish realistic expectations for the technology (American Probation and Parole Association, 2019). This discussion also serves to highlight the broad range of benefits and costs that were not captured in the current study. In 2001, Farrington, Petrosino and Welsh highlighted the lack of standardization of economic evaluation research on correctional interventions. Though not specific to EM, the development of a standard list of program benefits and costs would help overcome some of the difficulties presently faced by researchers. This need for standardization still exists in order to allow for comparison across studies of the cost effectiveness of EM. Future research should also explore the costs associated with staff time spent on EM related activities,

such as making referrals, applying and removing EM devices, and responding to alerts. When POs become more familiar and acquire more experience with EM, the time spent on these activities may potentially decrease. A large portion of the costs associated with EM are attributed to NMC staff salaries. There are advantages of having centralized monitoring centres such as this, including the ability to have all staff trained according to standard response protocols and holding clearly defined responsibilities (Martinovic, 2016). Future research may also examine the comparative cost-effectiveness of an in-house monitoring centre in comparison to outsourcing the monitoring services to a contracted security company.

This report represents the third and final study in a set of three examining EM's possible effects on offenders, staff, and stakeholders, as well as on community supervision practices and public safety. The first report focused on the operational aspects of the project, suggesting that it had been implemented properly and was serving as an important community supervision tool. While the current study does not endorse EM as a cost-effective method of reducing recidivism, the findings of the overall pilot suggest that it offers added benefit over current practice in effectively supervising higher-risk offenders who are conditionally released. The continued leveraging of EM as a discretionary tool as part of a larger supervision strategy should therefore rest on its contribution to improved case management and supervision capabilities.

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Appendix A: Definitions of Alerts

Table A1

Definition of Alerts

| | |
|----------------------------|---|
| Area Violations | |
| Exclusion Alarm | Occurs when the offender has entered an exclusion zone |
| Global Exclusion Alarm | Occurs when the offender has entered into an exclusion zone that is identified as a “children’s area” (i.e. school, park, playground) |
| Time Violations | |
| BLUbox Curfew Late Arrival | Occurs when a BLUbox or RF unit is utilized to manage curfew an offender and they arrive home late |
| BLUbox Curfew Left Early | Occurs when a BLUbox or RF unit is utilized to manage an offender curfew and they leave their residence early |
| Tampering | |
| Master Tamper | Occurs when there is an attempt to cut, remove, stretch or otherwise tamper with the strap attached to the device, or, when the device itself has been cracked/opened |
| BLUbox Light Tamper | Occurs when the RF unit has been cracked or opened and light penetrates the unit |
| Interference | |
| Jamming Possible | Occurs when the device detects the presence of a jamming device in its vicinity |
| Shielding Possible | Occurs when the device detects the presence of a material such as metal that is preventing it from communicating with the EM system |
| Equipment | |
| BLUbox Movement | Occurs when the RF unit has been moved |
| BLUbox Power Loss | Occurs when the RF unit has been unplugged |
| BLUbox Power Loss/Movement | Occurs when the RF unit has been unplugged and is moved |
| Battery Failure | |

| | |
|------------------------|--|
| Low Battery Alarm | Occurs when approximately 10 hours of charge remain and a 2.5-hour recharge is now required. The device will vibrate twice every 10 minutes until charged or dead |
| Critical Battery | Occurs when approximately 4 hours of charge remain and a 2.5-hour recharge is now required. The device will continue to vibrate twice every ten minutes until charged or dead |
| Dead Battery | Occurs when approximately 30 minutes of charge remain and a 2.5-hour recharge is required. The device will continue to vibrate twice every ten minutes until charged or dead |
| Other Technical | |
| Message Gap | Occurs when there is no cellular communication between the device and the EM system. Alert generates when the device has been unable to communicate with the system for 2 hours |
| BLUbox Message Gap | Occurs when the bracelet loses cellular communications but is in the presence of the RF unit. Alert generates when the device has been unable to communicate with the system for 2 hours |
| No GPS | Occurs when the GPS unit is not able to fix its position due to it not receiving signal from a sufficient number of GPS satellites. Alert generates when the device has been in an area without GPS (i.e. no satellites) for 2 hours |

Appendix B: Average Time Parole Officers Spent on Application and Removal Activities

Table B1

Time Spent on Application Activities

| EM activity | <i>M</i> time per EM period (minutes) |
|--|---------------------------------------|
| Total for Pre-Acceptance Activities | 40.0 |
| Time to consult with the POS for an EM referral | 17.9 |
| Time to complete and send Referral/Decision form | 19.8 |
| Time to consult with the CBRF Director | 2.4 |
| Total for Pre-Activation Activities | 3.8 |
| Time to complete and send Device Field Test Form | 3.8 |
| Time to complete field test | 0.0 |
| Total for Pre-Application Activities | 104.5 |
| Time spent testing the equipment prior to application | 20.5 |
| Time to identify and communicate geographic inclusion/exclusion zones and associated schedules | 39.0 |
| Time to explain and give the Notification for the Requirement of Electronic Monitoring | 25.0 |
| Time to review the Offender Instruction Form with the offender and collateral contacts | 18.3 |
| Time to forward the representation(s) to the Monitoring Device Coordinator | 1.2 |
| Time to input representation(s) into the Casework Record | 0.6 |
| Total for application activities | 66.1 |
| Time to apply the EM device | 20.4 |
| Time to document the application of the EM device in the Casework Record | 9.9 |
| Time to install the EM RF unit | 20.7 |
| Time to document the installation of the EM RF unit in the Casework Record | 4.9 |
| Time to explain the RF unit to the offender (and collateral contacts, if necessary) | 10.2 |
| Time required for other EM-related activities | 19.6 |

Table B2

Time Spent on Removal Activities

| EM activity | <i>M</i> time per EM period (minutes) |
|--|--|
| Total for Analysis / Monitoring of EM Data Activities | 136.3 |
| Time to complete the reassessment of the offender's risk | 19.9 |
| Time to respond to technical difficulty alerts | 21.8 |
| Time to respond to alerts other than a technical difficulty (such as tampering or violations of monitoring conditions) | 25.3 |
| Time required for inspections of EM devices/straps during regularly scheduled supervision visits | 57.2 |
| Time required to re-apply a device | 12.2 |
| Total for Removal Activities | 100.3 |
| Time to case conference with POS regarding the removal decision | 72.7 |
| Time to remove the EM device | 7.2 |
| Time to advise NHQ and NMC of the planned removal | 10.9 |
| Time to document the reason(s) for removal in the Casework Record | 9.6 |
| Total for Post-Removal Activities | 39.8 |
| Time to retrieve EM equipment | 39.8 |
| Total for Other Related Activities | 17.5 |