**Study design:** Randomised control trial with convergent mixed method evaluation

**Title:** Changing provider behaviour to increase nurse visits for obesity in family practice: The 5As Team Randomised Control Trial

**Running Title:** The 5As Team study

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DCS, JA, and AO wrote the ethics and protocol.
DCS, JA, AO, RA, AA, and AC conducted the intervention and evaluation, with clinical operations overseen by SF.
JA led the qualitative data collection, supported by DCS, AMO, AAO, and AC. All participated in regular data analysis and review meetings. RA, AO, and DCS oversaw the quantitative data collection. DCS, AO, and EPICORE oversaw the statistical analysis.
DCS and JA wrote the manuscript. All authors had access to data and analyses, reviewed the manuscript and provided comments, and can take responsibility for data integrity and accuracy.

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**Ethics**
The 5AsT study was approved by the University of Alberta Research Ethics Board (Pro00036740). Participants gave informed consent prior to taking part in the study.

Prior Research Presentations
Oral presentations at: North American Primary Care Research Group (NAPCRG) Annual Meeting – Cancun, Mexico, Oct 26-29, 2015 and the International Congress on Obesity 2016 – Vancouver, May 4, 2016.

**Guarantors**
DCS and AS guarantee this work with full access to the data and with the decision to publish. Statistical analyses have been verified by EPICORE, an independent agency. We affirm that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned and registered have been explained.

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## ABSTRACT

**Background:** Information is sparse on how to change primary care provider behaviour to improve obesity care.

**Methods:** We conducted a randomised control trial with convergent mixed method evaluation of a 6-month co-created, theoretically informed educational intervention. Twenty-four teams consisting of nurses, mental health workers, and dietitians in a Primary Care Network in Alberta were randomised. The primary outcome measure was the number of nurse visits with obesity care as a focus. Participants were blinded to outcome measure and analysts were blinded to allocation group. Analysis was by intention to treat. Qualitative thematic analysis of data from semi-structured interviews, field notes, and logbooks was used to identify contextual factors affecting uptake of the intervention. Blinded mixed-methods analysis was used to predict the impact of contextual factors on whether individual nurses increased their visits.

**Results**: The intervention group did not show a significant increase in visits over the 6-month intervention (rate ratio 1.30, 95% confidence interval 0.83 to 2.03, p=0.248) or the 9-months post-intervention (rate ratio 1.38, 95% confidence interval 0.87 to 2.19, p= 0.166). There was wide variability in visits by individual nurses, as predicted by *a priori* individual qualitative findings.

**Interpretation:** Despite co-creation of the intervention, the 5As Team Study did not demonstrate a statistically significant increase in the number of nurse visits due to wide


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variability among individual participants. Nevertheless, the novel mixed methods analysis provided important insights into barriers, challenges, and facilitators that health practitioners face regarding changing practice behaviours in the context of obesity management.

**Trial Registration:** NCT01967797

**Keywords:** Primary health care, obesity, disease management, interdisciplinary teams

**Abbreviations:** Primary Care Network (PCN)

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## INTRODUCTION

Obesity and its chronic disease complications are surging worldwide.(1,2) Yet healthcare professionals are poorly prepared to tackle the prevention and treatment of obesity in clinical practice; deficits in knowledge about the complexity of obesity and its management, as well as the need for team-based care contribute.(3) Evidence is sparse on how to change provider behaviour to improve obesity assessment and management in primary care.(4–6) A suite of tools and resources to support primary care providers called the "5As of Obesity Management™"("the 5As"- ASK, ASSESS, ADVISE, AGREE, ASSIST) has been developed in Canada.(7–11) This approach emphasizes obesity as a chronic disease requiring long-term treatment, the importance of prevention, and assessment of root causes to better understand how psychosocial and medical comorbidities promote obesity. Use of the 5As has been demonstrated to improve practitioners' efficacy in providing obesity counselling (12–14) and patient weight loss.(15)

The 5As Team (5AsT) program was developed in collaboration with a large Primary Care Network (PCN) in Alberta, Canada, to improve obesity management by allied health professionals, especially practice nurses embedded in family practices in the PCN. (4) The objective of this randomised control trial (the 5AsT Trial) was to assess whether a primary care interdisciplinary team intervention would increase the quantity of visits conducted by family practice chronic disease nurses in which substantive conversations about obesity occurred with patients.(16,17)

## METHODS

### Study design

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The 5AsT trial was an allocation concealed, blinded, randomised-control trial with convergent mixed methods evaluation (Appendix 1). The PCN partnered with the research team to: write the grant proposal and develop and implement a 6-month, team-based longitudinal intervention to address this gap in care delivery.(16,18) The study protocol was published previously.(17)

**Intervention:**

The 5AsT intervention design, theory, content, implementation, and participant attendance/evaluation have been published.(16,17,19) In brief, the intervention consisted of twelve two-hour large group interactive educational sessions delivered over six months. The intervention, which built upon the 5As of Obesity Management™ and the theoretical domains framework, was created in partnership with frontline providers based on self-assessed needs.(20) Interactive sessions addressing diverse aspects of obesity management were supported by an internal clinical champion - a dietitian - and external content experts according to need.(16) Sessions were followed by discussion in which interdisciplinary clinic teams consisting of nurses, dieticians, and mental health workers shared their experiences with, and barriers to, implementing what they had learned and set goals around their practices. The intervention sessions, video links, and tools are available online.(21)

All control and intervention participants received training in chronic disease management when they joined the PCN. This training included the Alberta Health Services Chronic Disease Management Training one-day course (seven hours) and Edmonton Southside

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Primary Care Network's obesity training (four hours). In addition, intervention participants received the six-month 5AsT intervention described above.

**Setting, randomisation, and participants**

The 5As randomised trial was conducted within a large PCN in Alberta, Canada, that served 157470 patients registered to 67 family practices in 2013. At that time, 24 family practices had PCN interdisciplinary team support comprised of registered nurses or nurse practitioners, registered dietitians, and mental health workers. Some mental health workers and dietitians served more than one practice but none worked in both intervention and control clinics. All healthcare providers randomised to the intervention consented to participate in the study. Clinic team member allocation (expressed as a proportion of a full-time position or FTE) and panel size (number of patients) are summarized in Appendix 2.

Clinic teams were randomised in a 1:1 ratio by a statistician external to the project, using a computer generated random sequence, with concealed allocation. Randomisation was stratified by clinic panel size, with three strata of eight clinics each: panel size ≤2 754, panel size from 2 755 to 6 576, and panel size ≥6 577. There were a few clinics with more than one nurse, however clustering was minimal. Simple randomisation was therefore done, and adjustment for minimal clustering was dealt with in the analysis. Clinics were allocated to intervention or control, 12 clinics to each arm (Figure 1 CONSORT flow chart, and Appendix 2).(22) The unit of analysis for the randomized control trial was the nurse.

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The intervention was delivered to all PCN employees of the 12 interdisciplinary teams; therefore, all participants contributed to the qualitative evaluation. All intervention participants consented to contribute to qualitative data collection. De-identified quantitative data was gathered from administrative data sources, extracted and coded by blinded analysts.

**Primary quantitative outcome**

The primary quantitative outcome measure was the number of visits conducted by the nurse in which obesity assessment and management was recorded as a significant focus of the visit. The content of the visit is recorded on routine forms for every patient encounter. For example, in a diabetes visit where obesity management was a focus, both diabetes and obesity would be indicated on the form. Encounter forms are periodically audited against clinic notes to ensure accurate capture.

Nurses often work part-time so the number of visits was adjusted for FTE. In addition, the total number of individual patient visits conducted during each quarter year (total clinical activity) varies between individual nurses owing to illness and vacation, and to their varied mix of clinical duties. Thus, we expressed the outcome measure of the number of visits with a component of obesity as a proportion of the total clinical activity for each quarter. This proportion is expressed as a rate ratio.

**Blinding**

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Participants were blinded to the primary outcome measure. Study data form part of routinely collected, administrative data. Analysts not affiliated with the research team extracted the data from the PCN administrative database and provided de-identified data to the data analysts. Analysts were blinded to group allocation.

**Statistical analysis**

Analyses were performed on administrative activity data aggregated quarterly from October 2012 to December 2014. This included up to twelve months of historic data prior to intervention, six months of intervention data, and nine months of data after intervention to measure sustainability of impact. Primary analysis was by intention to treat. The baseline differences in the primary outcome measure for the intervention and control groups were compared using the Mann–Whitney U test. Generalized estimating equation (GEE) analyses, with a negative binomial distribution, were used to compare the number of weight management clinical encounters between the 5AsT intervention and control groups. Analyses accounted for minimal clustering effects and for the stratification variable (clinic panel size). The statistical model is included in Appendix 3. The GEE was conducted using SAS version 9.4 (SAS Canada, ON, Canada). All other quantitative data analyses were conducted using the SPSS version 21 (SPSS Inc. Chicago, IL, USA). Spearman correlation coefficients between visits per total activity and quarterly time periods for each participant were calculated. All statistical analysis was verified by EPICORE, an independent agency (Appendix 4).

**Mixed Methods Analysis**



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The 5AsT study was designed as an RCT with mixed methods evaluation. The reason for this was to understand the factors that affected the uptake of the intervention, the implementation process, and the impact of the intervention beyond the quantitative outcome measure.(17,23,24)

Many factors affect participants' uptake of complex interventions. Convergent mixed methods allows a more complete understanding of individual provider results than either quantitative or qualitative results alone.(25,26) *A priori,* we conducted and reported on a detailed qualitative evaluation to understand the facilitators and barriers affecting the primary outcome measure.(27) Here we report the convergent mixed methods that assess to what extent these barriers and facilitators affected the uptake of the intervention by the nurses and their impact on the quantity of obesity visits.

The qualitative methodology has been published previously.(27) In brief, the core qualitative data set came from semi-structured interviews of the multidisciplinary team providers from the 5AsT intervention arm. Interview questions are provided in Appendix 5. Data were augmented by field notes on the 12 intervention sessions, written answers to our exit questionnaire, activity sheets from the interactive wrap-up session at month six (end of intervention phase) and the impact discussion session at month 12 (end of passive phase), and log books of the research practice facilitators. The data were analysed using thematic analysis.

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Data mixing was blinded to quantitative results and conducted by a PhD anthropologist (JA). Primary interviews and field notes were revisited to categorize each intervention participant by individual and contextual factors affecting their ability to conduct weight management visits. Factors corresponded to themes identified in our prior qualitative analysis (27): individual provider confidence or interest; patient and team relationships; clinical environment, role perception, referrals and communication; and views on the intervention's value. Participants were categorized as having barriers and/or positive facilitators to addressing obesity in visits. JA and DCS reviewed these tables for concurrence on categorization. We compiled detailed descriptions of contextual factors affecting participants' weight management visits and quantitative Spearman correlations of the outcome measure over time to provide a descriptive view of the data.

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## RESULTS

### Baseline characteristics

Table 1 shows the baseline characteristics of the nurses; there were 15 nurses in the intervention clinics and 17 nurses in the control clinics. One nurse from the intervention arm withdrew from the study post-randomisation and their data was not included. This individual was from a clinic with two nurses; and their colleague stayed in the trial. In the baseline year prior to the intervention, nurses conducted fewer visits where the focus was obesity than the control nurses (non-significant) (rate ratio 0.84, 95% confidence interval 0.47 to 1.49, p=0.544).

### Impact of the intervention on the primary outcome

The intervention group compared to the control group had a 30% increase in the point estimate of the number of visits conducted over the 6-month intervention but this difference did not achieve statistical significance (rate ratio 1.30, 95% confidence interval 0.83 to 2.03, p=0.248). The point estimate over the 9-month sustainability phase showed a 38% increase, again not statistically significant (rate ratio 1.38, 95% confidence interval 0.87 to 2.19, p=0.166) (Figure 2). Table 2 provides rate ratio estimates with 95% confidence intervals. Table 3 provides summary statistics on visits with obesity management as a percentage of total clinical activity.

With regard to individual nurses there was wide variation in visits focusing on obesity. These supplemental data are provided in Appendix 6 and 7. Mixed-method comparison of the qualitative analysis of individual nurses' barriers and facilitators to changing practice, and the quantitative individual results of the Spearman correlation revealed 86% concordance. (Appendix 8) This variability drove the broad confidence intervals in the main results, and this variability was largely explained by the qualitative results.

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## DISCUSSION

There are international calls to increase education of primary care providers in obesity management to address major gaps in evidence translation and care; yet, there is a paucity of data on how to change provider behaviour to increase obesity visits. (3–6) We found wide variability in the impact of the intervention on the number of nurse visits for obesity between the different participants. Compared to the control group, the intervention group had a 30% increase in the point estimate of the number of visits



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conducted over the 6-month intervention, and 38% over the 9-months sustainability phase, albeit with large variability between individual providers. The mixed methods analysis shed light on this variability by demonstrating the role of individual nurses' barriers and facilitators. Individual provider confidence, their personal views of obesity management, their role identity, and both their interdisciplinary relationships and patient relationships within their practice were found to affect individuals' uptake of the intervention.

Our observation of variability in uptake of the 5AsT intervention is consistent with previous observations regarding behaviour change in health practitioners. A recent Cochrane review of interventions to change the behaviour of health professionals and the organization of care to promote weight reduction, highlights the paucity of trials in the area.(6) Two other randomized control trials of educational interventions for primary care providers have focused on patient weight loss outcomes. Moore and colleagues ambitious trial in 44 primary care practices in England was hampered by variable uptake by practitioners, resulting in inability to draw conclusions about the effectiveness of the intervention.(28) They did demonstrate that practitioners increased their self-reported knowledge and inclusion of learned strategies in practice. Martin and colleagues conducted a randomized trial of physician training and support of a multidisciplinary team to improve obesity care.(29) The target population was low income, African American women in primary care with a focus on weight loss in patients as the outcome. Statistically significant modest weight loss was achieved. Future research in this area should be encouraged to utilize the potential of mixed methods to explain results.

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**Strengths and Limitations**

The 5AsT Program is grounded in theory and participative research. It was co-created from conception, through design, and implementation with our partners, and they informed the content and structure of the intervention. As predicted by theoretical domains framework, a number of factors affect whether or not individuals will change their professional practice. The use of mixed methods allowed for richer understanding of why individuals had differential uptake of the intervention.

We recognize a number of limitations to our work. Although this is one of the largest real-world studies on behaviour change in obesity management to date, the actual sample size was rather limited. There was also considerable individual variation in clinical activity, largely explained by qualitative differences in provider barriers and challenges. It is further important to note that our intervention did not focus on other clinic members such as reception, clinical assistants, family doctors, managers, or patients, all of who may have significant influence on management change. The patient perspective on this intervention is being assessed in ongoing patient studies around patient values and preferences as to how they receive care to support obesity prevention and management. We are also currently testing a physician training intervention, which uses the lessons learned in this study.

**CONCLUSION**

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Despite significant involvement and co-creation of the intervention by the intervention participants, the 5As Team Study did not demonstrate a statistically significant increase in the number of primary care nurse visits that focused on obesity. While we observed a 30-38% increase in the point estimate, this difference failed to reach statistical significance due to wide variability among individual participants. Nevertheless, the novel mixed methods analysis used in this study provides important insights into the barriers and challenges as well as facilitators that health practitioners face regarding changing practice behaviours in the context of obesity management.

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**CONFLICT OF INTEREST STATEMENTS**

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf. We declare the following interests: DL Campbell-Scherer is an unpaid board chair for the Edmonton Southside Primary Care Network; J Asselin, AM Osunlana, AA Ogunleye, S. Fielding, R Anderson, J Johnson have nothing to disclose. AM Sharma is a member of an Advisory Board with a commercial organization (Novo Nordisk: Advisory Board for anti-obesity drug); AM Sharma was a



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member of the Data Safety Monitoring Board for an anti-obesity trial (Takeda). A Cave reports a grant from Astra-Zeneca for an asthma study.

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**Table 1** Baseline characteristics of the clinic-based RN/NP participants

| Demographics | | | | Obesity management encounters per total clinical activity | | | |
|---|---|---|---|---|---|---|---|
| | Age | Clinic panel size (Oct 2013) | Full time equivalent employment | Mean<br><br>Percent (standard deviation) | Median | Lower quartile | Upper quartile |
| Control group (n=16 RNs/NPs) (interquartile range) | 49.5 (17) | 7 141 (10 317) | 0.90 (0.40) | 4.54% (3.071%) | 3.9% | 2.4% | 7.1% |
| 5AsT intervention group (n =15 RNs/NPs) (interquartile range) | 44.0 (21) | 5 976 (6 595) | 0.83 (0.50) | 3.66% (4.31%) | 1.9% | 0.2% | 8.2% |

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**Table 2** Rate ratio estimates with 95% confidence intervals (FTE was used as an offset) [Cluster level analysis]

| | | Rate ratio | 95% confidence interval | P value |
|---|---|---|---|---|
| Group | Control | Referent | | |
| (at baseline) | 5AsT Intervention | 0.84 | 0.47 to 1.49 | 0.544 |
| Time period | | | | |
| | Baseline (Q1-4) | Referent | | |
| | Intervention (Q5-6) | 0.95 | 0.78 to 1.16 | 0.641 |
| | Post-intervention (Q7-9) | 0.79 | 0.6 to 1.05 | 0.108 |
| | | | | |
| Group*time period interaction | | | | |
| **Main outcome after 6 month intervention** | **Intervention group*Intervention** | **1.30** | **0.83 to 2.03** | **0.248** |
| **Main Outcome after 9 month sustainability phase** | **Intervention group*Post-intervention** | **1.38** | **0.87 to 2.19** | **0.166** |
| | | | | |
| Total activity | | 1.0005 | 1.0002 to 1.0007 | <0.0001 |
| | | | | |
| Clinic panel size | ≤2 754 | Referent | | |
| | 2 755 to 6 576 | 0.47 | 0.23 to 0.99 | 0.046 |
| | ≥6 577 | 0.56 | 0.28 to 1.14 | 0.109 |

Correlation structure: Autoregressive of order 1
Inference is based on robust standard error
Q = quarter of year; Total activity = quarterly total of all clinical encounters
See appendix 1 for details of the statistical model.

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**Table 3** Summary statistics of the obesity management visits per total activity (%) for different study periods, 10/2012 to 12/2014. Baseline 12 months, intervention 6 months, post-intervention 9 months. See consort diagram for details.

| Time Period | Control group Median (IQR) | Intervention group Median (IQR) |
|---|---|---|
| Baseline | 3.77% (2.61-6.33) | 2.08% (0.48-7.98) |
| Intervention | 2.49% (1.30-5.59) | 1.54% (0.63-8.34) |
| Post-Intervention | 2.61% (1.10-3.92) | 3.91% (0.64-8.79) |

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Figure 1: CONSORT diagram

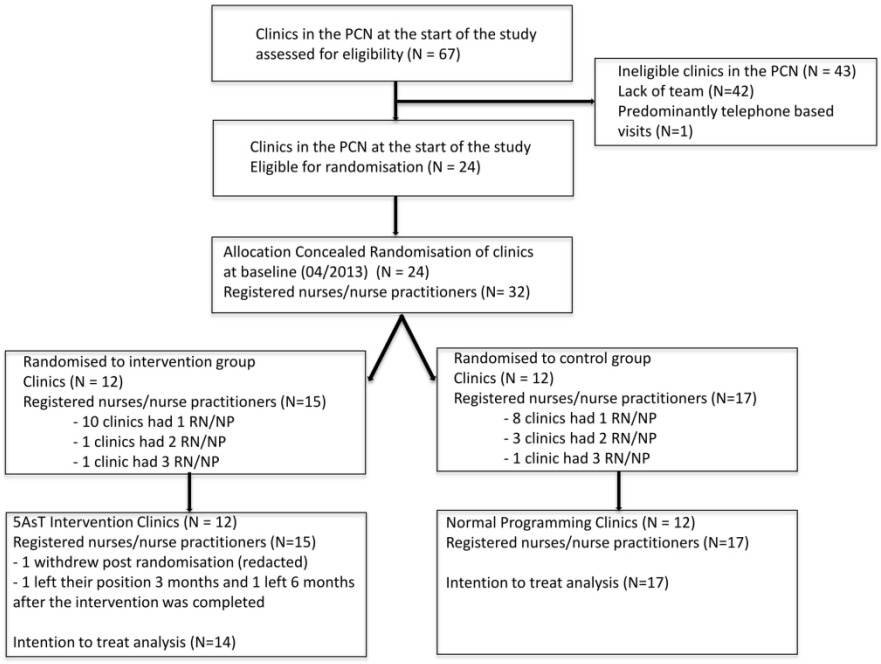



Figure 1: CONSORT diagram

190x142mm (300 x 300 DPI)

Figure 2: Primary outcome measure: Number of visits/FTE

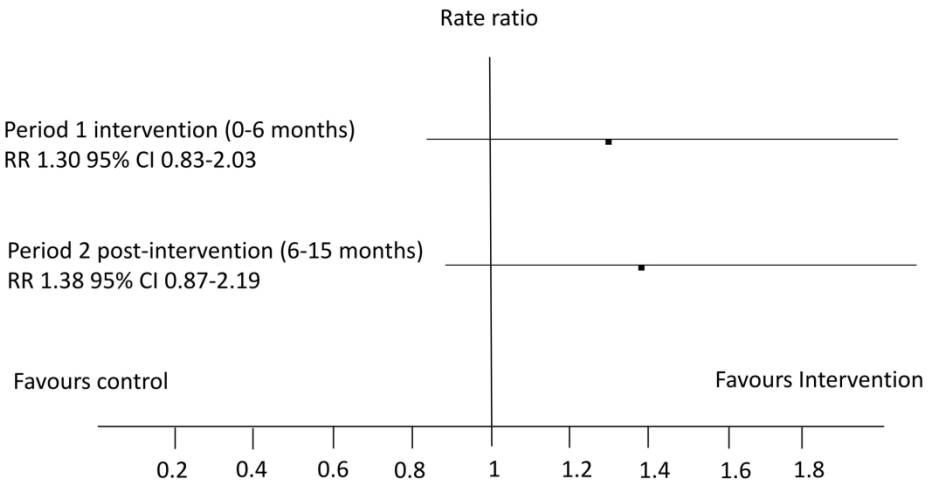
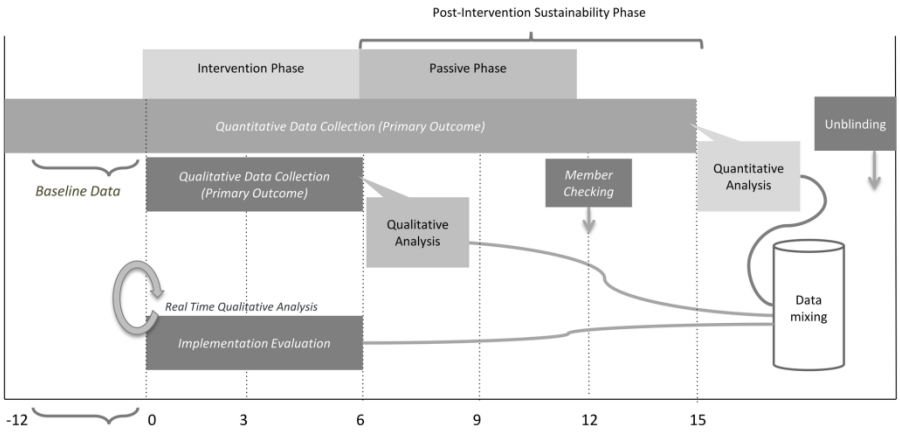



Figure 2: Primary outcome measure: Number of visits/FTE

190x142mm (300 x 300 DPI)

APPENDIX 1: 5As Team intervention study diagram

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## APPENDIX 2: Randomisation of eligible clinics

Randomisation of the Eligible 24 Clinics by Panel Size and Provider FTE
Three strata of eight clinics each: panel size ≤2 754, panel size from 2 755 to 6 576, and panel size ≥6 577. Clinics were allocated to intervention or control, 12 clinics to each arm. Nurses/ Nurse Practitioners (RN), Dietitians (RD), Mental Health Workers (MHW)

| Intervention Clinic | Panel Size | RN FTE | RD FTE | MHW FTE | Control Clinic | Panel Size | RN FTE | RD FTE | MHW FTE |
|---|---|---|---|---|---|---|---|---|---|
| **P** | 2754 | 0.4 | 0.1 | 0.3 | A | 2049 | 0.5 | 0.04 | * |
| **M** | 2532 | 0.5 | 0.05 | 0.1 | I | 2194 | 0.5 | 0.1 | 0.5 |
| **V** | 1834 | 0.5 | 0.1 | * | Q | 2418 | 0.5 | 0.05 | * |
| **O** | 2152 | 0.5 | 0.1 | 0.1 | X | 2735 | 0.6 | 0.05 | * |
| **S** | 5349 | 0.5 | 0.05 | * | H | 6120 | 1 | 0.18 | 0.3 |
| **D** | 4438 | 1 | 0.1 | 0.4 | J | 3893 | 1 | 0.1 | 0.2 |
| **U** | 5649 | 0.85 | 0.15 | 0.2 | L | 3281 | 0.6 | 0.13 | 0.1 |
| **N** | 6229 | 1 | 0.15 | 0.2 | R | 6576 | 1.2 | * | 0.4 |
| **C** | 11899 | 1 | 0.2 | 0.4 | B | 10336 | 1 | 0.18 | 0.45 |
| **G** | 8476 | 1.8 | 0.1 | 0.2 | E | 9162 | 1.4 | 0.15 | 0.5 |
| **F** | 9677 | 1.8 | 0.2 | 0.5 | W | 13598 | 1 | 0.2 | 0.2 |
| **T** | 11684 | 1 | 0.18 | 0.4 | K | 13640 | 2.8 | 0.2 | 0.6 |

*** Supported by off-site referral**

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## APPENDIX 3: Statistical model

### Model and interpretation

**Model**

$\log\{E(y_{ij})\} = \beta_0 + \beta_1 Group_i + \beta_2 Period1_i + \beta_3 Period2_i + \beta_4 Group_i*Period1_i + \beta_5 Group_i*Period2_i + \beta_6 t_{ij} + \beta 7 s_i + \log(FTE_{ij})$

$i = 1, 2, \ldots, 31$ and $j = 1,2, \ldots, 9$

Where, $y_{ij}$ = number of obesity visits for $i^{th}$ provider at $j^{th}$ quarter

$Group_i = 1$ if group is 2; otherwise 0

$Period1_i = 1$, if time period is intervention; otherwise 0

$Period2_i = 1$, if time period is post-intervention; otherwise 0

$t_{ij}$ = Total activities for the $i^{th}$ provider at $j^{th}$ quarter

$s_i$= Panel size of the clinic of $i^{th}$ provider

$FTE_{ij}$ = Full time equivalent of $i^{th}$ provider at $j^{th}$ quarter

**Interpretation of the parameters**

| Group | Time period | $\log\{E(y_{ij})/FTE_{ij}\}$ |
|---|---|---|
| 1 | Baseline | $\beta_0 + \beta_6 t_{ij} + \beta_7 s_i$ |
| | Intervention | $\beta_0 + \beta_2 + \beta_6 t_{ij} + \beta_7 s_i$ |
| | Post-intervention | $\beta_0 + \beta_3 + \beta_6 t_{ij} + \beta_7 s_i$ |
| | | |
| 2 | Baseline | $\beta_0 + \beta_1 + \beta_6 t_{ij} + \beta_7 s_i$ |
| | Intervention | $\beta_0 + \beta_1 + \beta_2 + \beta_4 + \beta_6 t_{ij} + \beta_7 s_i$ |
| | Post-intervention | $\beta_0 + \beta_1 + \beta_3 + \beta_5 + \beta_6 t_{ij} + \beta_7 s_i$ |

**Interpretation of the model**

| | $\log\{E(y_{ij})/FTE_{ij}\}$ | |
|---|---|---|
| Baseline | * | * |
| Intervention | $\beta_2$ | $\beta_2 + \beta_4$ |
| Post-intervention | $\beta_3$ | $\beta_3 + \beta_5$ |
| | Group1 | Group2 |

Hence $\beta_4>0$ would indicate an increase in the obesity/weight management visit rate per FTE in the intervention period comparing to baseline period in group 2.

$\beta_5>0$ would mean an increase in the obesity/weight management visit rate per FTE in the post-intervention period comparing to baseline period in group 2.

Note: Use of a GEE with negative binomial family and log of FTE as an offset is according to our protocol. FTE was too coarse a measure to reflect the variability in participant activity during the time periods. Total activity captures variability due to FTE, illness, vacation, secondment to administrative duties, etc. Thus we controlled for total activity by including it in the model as a covariate. We did account for clustering and did adjust for the stratification variable according to Kahan and Morris, BMJ 2012; 345:e5840.

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## APPENDIX 4: Letter confirming independent statistical review

UNIVERSITY OF ALBERTA

October 21, 2015.

Denise Campbell-Scherer, MD, PhD, CCFP, FCFP
Associate Professor,
Department of Family Medicine,
University of Alberta

Dear Dr. Campbell-Scherer:

Thank you for asking us to act as an independent statistical reviewer for your paper, entitled "Implementation and Evaluation of the 5As of Obesity Management in Primary Care: the 5As Team (5AsT) Randomised Control Trial".

My statistician, Imran Hassan, and I have performed a thorough review of your dataset and manuscript, and can attest that the analyses have been performed correctly.

As you know, EPICORE Centre (www.epicore.ualberta.ca) has over 20 years of experience in clinical trials and health outcomes research, having completed over 700 projects and supporting over 260 different investigators.

Congratulations on an excellent paper.

Sincerely yours,

Ross T. Tsuyuki, BSc(Pharm), PharmD, MSc, FCSHP, FACC
Professor of Medicine and Director,
EPICORE Centre
Platform Lead, Consultation and Research Services
Alberta Strategy for Patient Oriented Research (SPOR)

***Ross T. Tsuyuki, BSc(Pharm), Pharm.D., M.Sc., FCSHP, FACC,***
***Professor of Medicine and Director, EPICORE Centre - Department of Medicine***

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## APPENDIX 5: Interview guide

### Semi-structured interview guide for PCN practitioners

Following standard qualitative practice, interview guides will be informed by study analysis and will therefore be subject to change as needed. As semi-structured interviews deliberately allow for participants and interviewers to adjust interview focus according to responses and participant interests, not all interviews will follow the same format. Interviews will be led by the same general areas and questions of focus as given below, time sensitivity may mean not all of these areas are covered in interviews. (Duration approximately 1 hour.)

1. **Background information:**
   - Tell me about your role in the PCN?
   - How long have you been working with the PCN?
   - Can you tell me about a typical work week, what kind of tasks you do, what work do you do with other PCN staff?
   - What was your experience with the 5As program previous to this study?

2. **5As Questions:**
   - Can you describe your experience with the 5As framework?
   - How do you feel about the 5As framework and tool kit? (is there a need?)
   - Tell me about your experience of the 5As training day? How have you found the sessions?
   - What have been your experiences with 5As implementation?
   - Do you anticipate this influencing how you interact with patients who are actively managing their weight? (ask to expand)
   - What would influence your use of the 5As, or increase the usefulness of the intervention? (do you have everything you need? Skills, resources, information?)
   - When appropriate, do you routinely ask patients to discuss their weight? (Why? not?)
   - How confident are you at discussing the root causes or obesity with patients?
   - How would they recommend that we change the 5As (external to this interview can we go through this with you)

3. **Team Effectiveness:**
   - Do and your coworkers have the skills and information necessary to implement this framework?
   - Do you think you share an understanding with your coworkers regarding an approach to obesity management?
   - Do you notice a difference in how providers at the clinics you attend deal with weight management? (does this influence your work?)
   - How is the communication between members of your clinic who are working with the 5As framework?

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4. **Innovations Questions:**
   - How does the 5As framework fit your own values/priorities, or with the values/priorities of your clinic?
   - How does the 5As framework fit with existing programs and support? Are there any conflicting components of the 5As framework?
   - What are some of the underlying barriers to in-clinic weight management that you are aware of?
   - How have you tried to address these barriers in the past?

5. **Implementation Questions:**

How would you describe the support you receive by PCN management and your own clinic?

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**APPENDIX 6: Supplemental results**

Impact of individual intervention provider and contextual facilitators and barriers on providers' abilities to conduct obesity management visits

| Intervention Provider ID | Clinical Role | Confidence & Personal Views | Patient/team relations & clinic environment | Summary |
|---|---|---|---|---|
| 26<br><br>(10)*<br><br>**MAJOR BARRIERS** | - Strong emphasis on diabetes with an assortment of other patient groups.<br>- In their previous clinic, had more weight management. | - Acknowledges avoidance of weight management due to feelings of awkwardness, lack of skill set & feelings of dread for these visits.<br>- Very positive views towards intervention.<br>- Reports that she writes down goals.<br>- Finds 'task focused' work easier, such as diabetes, or her other work in tertiary care. Weight is not 'task focused.' | - Still working on developing long-term relationships with patients.<br>- Still in the process of developing collegial relations with other providers in clinic.<br>- Lacks referrals from the physicians for weight management.<br>- Perceives minimal interest in weight management by the physicians. | **Major Issues:**<br>- Clinic environment & lack of referrals.<br>- Lack of confidence in addressing weight.<br>- Lack of patient & colleague relationships.<br><br>**Indirect issues:**<br>- Recent move to new clinic.<br><br>**Positives:**<br>- Positive 5AsT views. |
| 9<br><br>(6)*<br><br>**MAJOR BARRIERS** | - Previous emphasis on chronic disease, diabetes, and physicals (varied).<br>- Does not see many patients for weight management at new clinic. | - Newer practitioner.<br>- Lack of confidence bringing up weight and was not familiar with the 5As approach.<br>- Likes the 5As approach, but has not applied it.<br>- Feels more confident and knowledgeable since the intervention.<br>- Positive views of the intervention. | - Still in the process of developing longer term relationships with patients.<br>- Still in the process of developing collegial relations with other providers in clinic.<br>- Although the clinic team is open to new ideas/resources, the clinic is very busy, which hinders communication and limits her capacity.<br>- Although clinic is focused on | **Major Issues:**<br>- Referrals for chronic disease & weight management currently go to another provider in the clinic.<br><br>**Indirect Issues:**<br>- Has not developed collegial relations with clinic staff yet.<br>- Lacks some confidence in weight management. |

| | | | | |
|---|---|---|---|---|
| | | - Feels she will be more comfortable addressing 5AsT with clinic team, once she has developed stronger relations with them. | improving access for patients, she perceives that PCN education programs are underutilized.<br>- Perceives that weight management is not a priority in the clinic. | **Positives:**<br>- Can see applicability of intervention & thinks it will impact her work, particularly physicals. |
| 7<br><br>(11)*<br><br>**MAJOR BARRIERS** | - Emphasis on geriatric management, women's health, and infant care | - Strong patient relationships.<br>- Routinely brings up weight with patients, but lacks confidence in overall weight management.<br>- Was not familiar with the 5As before the intervention.<br>- Positive views of intervention.<br>- Feels she discusses weight more often since the intervention. | - Lacks referrals from physicians.<br>- Feels comfortable talking to physicians about messaging & concerns, but time is a barrier.<br>- Very supportive clinic environment.<br>- Clinic team is sometimes resistant to change. | **Major Issues:**<br>- No weight management referrals.<br><br>**Indirect Issues:**<br>- Lack of confidence in managing weight.<br>- Time constraints inhibit communication with physicians.<br><br>**Positives:**<br>- Comfortable asking about weight, asks often.<br>- Very supportive clinic. |
| 19<br><br>(8)*<br><br>**MAJOR BARRIERS** | - Performs a wide variety of tasks, usually works alongside the physician. | - Lacks confidence in discussions of weight management and root cause assessments.<br>- Was not familiar with 5As.<br>- Uncomfortable with some sessions of intervention.<br>- Since the intervention, has been using 'ASK' more. | - Strong collegial relations with physicians and clinic team.<br>- Perceives minimal interest in weight management at clinic.<br>- Supportive environment with good, open communication. | **Major Issues:**<br>- Lack of confidence with weight management and root cause assessment.<br><br>**Positives:**<br>- Supportive clinic environment. |

| | | | | |
|---|---|---|---|---|
| 8<br><br>(12)*<br><br>**BARRIERS & FACILITATORS** | - Strong emphasis on diabetes & prenatal.<br>- Some cognitive screening for elderly patients.<br>- Doesn't see patients specifically for weight management. | - Likes the 5As approach, but not completely comfortable yet.<br>- Feels more comfortable bringing up weight once relationship is established.<br>- Positive views of intervention. | - Physicians and clinic team are supportive and collaborate spontaneously at times.<br>- Very good work environment.<br>- Feels staff would be receptive to resources.<br>- Perceives that physicians in her clinic may not be addressing weight with patients. | **Indirect Issues:**<br>- Sees patients for diabetes, not weight management.<br>- Not comfortable bringing up weight unless circumstances are right.<br>- Weight is not focused on in the clinic.<br><br>**Positives:**<br>- Very good work environment.<br>- Collaboration, team support, solid communication. |
| 29<br><br>(10)*<br><br>**BARRIERS & FACILITATORS** | - Strong emphasis on chronic disease management, diabetes, prenatal, and patient education. | - Lacks confidence in addressing weight without first developing a relationship with patient or when patient is pregnant.<br>- Likes the intervention, but not confident on how to apply it. | - Still working on developing long-term relationships with patients.<br>- Gets a few referrals for weight management, but feels some referrals are inappropriate.<br>- Supportive clinic environment.<br>- Perceives a lack of information sharing. | **Major Issues:**<br>- Lack of confidence in addressing weight.<br>- Short time at clinic, little opportunity to build relationships with patients.<br><br>**Indirect Issues:**<br>- Some inappropriate referrals.<br><br>**Positives:**<br>- Gets some referrals for weight management.<br>- Positive clinic environment. |

| | | | | |
|---|---|---|---|---|
| 3<br><br>(7)*<br><br>**BARRIERS & FACILITATORS** | - Emphasis on chronic disease and follow-up.<br>- Space limitations in clinic make it difficult to see patients. | - Lacks confidence discussing weight when embedded with other issues.<br>- Likes the intervention and new information.<br>- Feels more confident since intervention, using the tools, and conducting a root cause assessment.<br>- Has seen some changes using 'Ask' (one of the 5AS). | - Perceives that physicians provide inconsistent messaging.<br>- Gets some referrals for weight management.<br>- Uncomfortable bringing up issues with clinic team or suggesting new ideas.<br>- Does not feel the clinic team is open to change. | **Major Issues:**<br>- Space limitations.<br>- Uncomfortable bringing up changes or suggestions at clinic.<br>– Physicians provide inconsistent messaging.<br><br>**Positives:**<br>- Feels more comfortable with weight management since intervention.<br>- Receiving some referrals from physicians. |
| 11<br><br>(12)*<br><br>**POSITIVE FACILITATORS** | - Emphasis on women's health, prenatal, and chronic disease. | - Believes weight management needs to be addressed in discussions of chronic disease.<br>- Very comfortable with weight management, but does not bring it up as much as she feels she should.<br>- Had not heard of the 5As before intervention, but likes the approach.<br>- Open to new ideas, feels comfortable suggesting changes. | - Perceives physicians do not see her as a resource for weight management and does not feel she is being used to her full capacity in terms of her potential role.<br>- Good collaboration with dietician.<br>- Good clinic communication and is a supportive, learning environment.<br>- Weight is addressed by most physicians at clinic. | **Indirect issues:**<br>- Does not address weight as often as she feels she should.<br>- Focused more on women's health rather than chronic disease.<br>- Is not sure the physicians are using her to her full capacity.<br><br>**Positives:**<br>- Comfortable asking about weight & does some weight management.<br>- Good clinic communication.<br>- Some physicians focus on weight.<br>- Likes intervention, anticipates impact. |

| | | | | |
|---|---|---|---|---|
| 22<br><br>(9)*<br><br>**POSITIVE FACILITATORS** | - Strong emphasis on chronic disease management and primary care<br>- Sees patients to get them started on weight management | - Comfortable discussing weight & asks patients occasionally.<br>- Feels confident, but motivation is seen as a barrier.<br>- Some familiarity with 5As.<br>- Very positive about intervention. | - Good communication in clinic.<br>- Very supportive environment.<br>- Clinic team is open to new resources and ideas. | **Major Issues:**<br>- Limited time in the clinic.<br><br>**Positives:**<br>- Comfortable with weight management.<br>- Aware of needs to change,<br>- Positive clinic environment, good communication. |
| 28<br><br>(12)*<br><br>**POSITIVE FACILITATORS** | - Conducts a variety of activities including weight management & diabetes.<br>- Most of her weight management visits are embedded. | - Comfortable with weight management and routinely asks, but likes to have a patient relationship first.<br>- Was not really familiar with the 5As, but really enjoyed intervention.<br>- Anticipates changing her practice to incorporate some of the information from the sessions. | - Feels she is able to work to her full capacity.<br>- Good open communication in clinic between physicians and clinic staff.<br>- Some messaging concerns but she feels those are being addressed.<br>- Is sharing with the physician messaging learned in the clinic, addressing issues as they arise. | **Indirect Issues:**<br>- Some messaging concerns with providers, but feels it is being addressed.<br>- Sees mostly embedded weight issues<br><br>**Positives:**<br>- Good clinic communication.<br>- Sees some patients for weight management.<br>- Comfortable addressing weight. |
| 27<br><br>(11)*<br><br>**POSITIVE FACILITATORS** | - Strong emphasis on chronic disease management.<br>- Does not usually see patients specifically for weight management. | - Lacks confidence asking, but does so often.<br>- Feels more confident since the intervention and asks about weight more often.<br>- Positive views of intervention and is starting to see change and more collaboration in clinic. | - Strong team collaboration with PCN members.<br>- Does not feel as though she is being used to her full capacity.<br>- Communicates well with team.<br>- One physician uses her more than the others.<br>- Is working with front-end colleague who will book directly | **Indirect Issues:**<br>- Some messaging issues with physicians.<br>- Not many referrals.<br><br>**Positives:**<br>- Discuses weight with most patients even though not many weight management visits. |

| | | | | |
|---|---|---|---|---|
| | | | with her now regarding weight.<br>- Some negative approach to change, some resistance from physicians for follow through on new ideas or innovations.<br>- Feels comfortable sharing new information with the physicians.<br>- Not getting many referrals. | - Fairly confident, already changing because of the intervention.<br>- Examples of collaboration. |
| 4<br><br>(6)*<br><br>**POSITIVE FACILITATORS** | - Emphasis on chronic disease management & prenatal care | - Comfortable with weight management visits and patient centered approach.<br>- Was not familiar with 5As before, but likes the approach and has used some of the tools.<br>- Feels she has made changes in her practice since the intervention. | - Good supportive team environment, with appropriate referrals made to team members to divide up weight management tasks.<br>- Gets weight management referrals.<br>- Good communication and shared messaging.<br>- Clinic staff not open to new ideas. | **Positives:**<br>- Good communication & shared messaging between providers.<br>- Confident asking about weight.<br>- Gets physician referrals.<br>- Anticipates positive change from the intervention. |
| 21<br><br>(10)*<br><br>**POSITIVE FACILITATORS** | - Strong emphasis on chronic disease management. (e.g., chronic obstructive pulmonary disease, diabetes, weight management) & strong focus on prenatal care | - Routinely brings up weight with patients<br>- Very confident, discusses the issues often.<br>- Positive reviews of the intervention<br>- Likes the 5As framework & states she is more conscious of using the 5As | - Strong patient relationships,<br>-Has longer appointments.<br>- Identifies asynchronous clinic times for dietician & mental health worker as a barrier to collaboration<br>- Good relations with physicians & team<br>- Highly cooperative clinic culture<br>- Deliberate high functioning communication in clinic<br>- Positive & optimistic when thinking about making changes | **Positives:**<br>- Sees patients for weight management & gets referrals.<br>- Good clinic communication & shared messaging.<br>- Positive 5AsT views. |

| | | | | |
|---|---|---|---|---|
| | | | in her clinic | |
| 20<br><br>(12)*<br><br>**POSITIVE FACILITATORS** | - Has a diverse patient group with an emphasis on chronic disease, diabetes, and phone counselling, | - Comfortable with broad range of influential factors.<br>- Comfortable bringing up weight.<br>- Appreciates the 5As approach<br>- Excited about the intervention. | - Good communication & sharing of information with clinic team.<br>- Supportive learning environment.<br>- Positive & respectful atmosphere for patients. | **Positives:**<br>- Sees patients for chronic disease & discusses weight.<br>- Good clinic communication & shared messaging.<br>- Positive 5AsT views. |

* number of sessions attended out of a total of 12 sessions

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**APPENDIX 7** Spearman correlation coefficient between obesity/weight management visits per total activity and time periods for each provider

| Control group | | | | Intervention group | | | |
|---|---|---|---|---|---|---|---|
| Providers' ID | Correlation coefficient | N | P value | Providers' ID | Correlation coefficient | N | P value |
| 1 | -0.72 | 9 | 0.037 | 3 | -0.17 | 9 | 0.678 |
| 2 | -0.90 | 9 | 0.002 | 4 | -0.07 | 7 | 0.906* |
| 5 | -0.8 | 5 | 0.133 | 8 | -0.55 | 9 | 0.133 |
| 6 | 0.87 | 9 | 0.002 | 7 | -0.47 | 9 | 0.213 |
| 12 | 0.52 | 9 | 0.162 | 11 | 0.97 | 9 | <0.001 |
| 13 | 0.12 | 6 | 0.827 | 9 | -0.71 | 5 | 0.182 |
| 14 | -0.62 | 9 | 0.086 | 20 | 0.58 | 9 | 0.108 |
| 16 | -0.03 | 9 | 0.948 | 21 | -0.40 | 9 | 0.291* |
| 17 | -0.15 | 9 | 0.708 | 22 | 0.43 | 9 | 0.250 |
| 15 | -0.68 | 9 | 0.050 | 26 | -0.40 | 8 | 0.327 |
| 18 | -0.95 | 9 | <0.001 | 27 | 0.73 | 9 | 0.031 |
| 23 | 0.32 | 9 | 0.410 | 28 | 0.21 | 9 | 0.590 |
| 25 | 0.20 | 9 | 0.613 | 29 | 0.60 | 4 | 0.417 |
| 24 | -0.55 | 9 | 0.133 | | | | |
| 31 | 0.20 | 4 | 0.917 | | | | |
| 30 | -0.65 | 9 | 0.067 | | | | |
| 32 | 0.14 | 8 | 0.752 | | | | |
| Mean (95% CI) | -0.22 (-0.50 to 0.07) | | | | 0.06 (-0.28 to 0.39) | | |
| Median (IQR) | -0.15 (-0.68 to 0.20) | | | | -0.07 (-0.40 to 0.58) | | |

Wilcoxon Mann-Whitney test comparing average correlation between the groups:
W = 74.5 p-value = 0.137
N = number of repeat measures contributing to estimate (maximum possible 9)
*Discordant with the qualitative data; possible explanations #4 had the lowest attendance in the intervention of all participants; #21 had one of the highest baseline rates of weight management visits so may have had a ceiling effect. #19 did not code any visits for weight management during the study, so could not have a correlation coefficient calculated.

There is 86% concordance between what individual nurses identified as major barriers or positive facilitators to changing practice and their trends either to decrease or increase the number of visits in which they focused on obesity management. Two discordant participants #4 and #21 (red in chart above) were evaluated *a priori* as having positive facilitators to changing practice from the qualitative data

(Appendix 4), yet had negative correlation coefficients. Provider 21 attended 10/12 sessions, and had one of the highest baseline rates at one point for weight management after which there was no visible trend. We suspect a ceiling effect was observed. Provider #4 only attended 6/12 intervention sessions, which we suspect was insufficient to achieve a change. Similarly, Provider #3 had challenges with personal confidence, and attended only 7/12 sessions, with minimal change in weight management visits over time. Three providers were evaluated as having mid-range barriers with some facilitators to conducting weight management (blue in Appendix 5). One of these, #29, emphasized a positive team environment in clinic with some lack of confidence and experienced a large positive increase in visits from the intervention.

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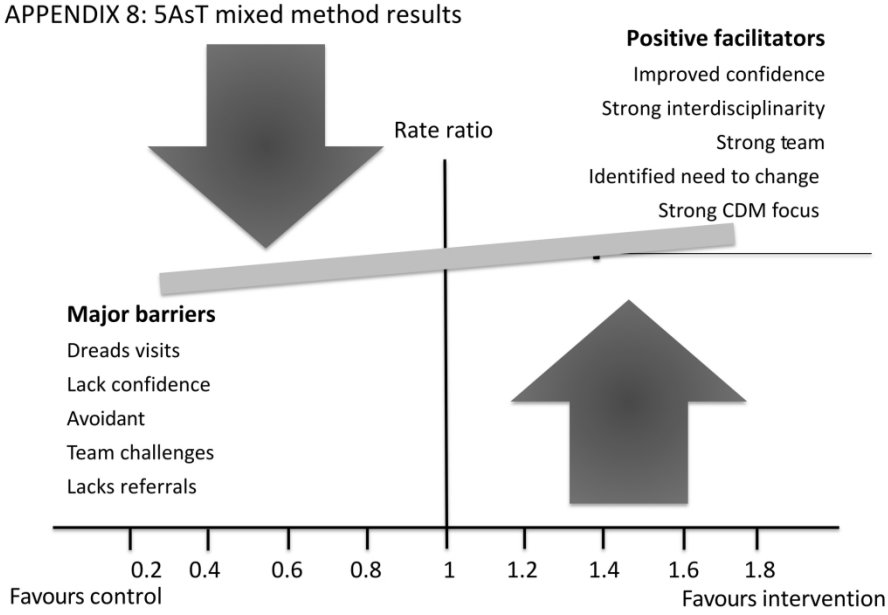
APPENDIX 8: 5AsT mixed method results

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