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The effects of a computerized clinical decision aid on clinical decision-making in psychosis care

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ABSTRACT

Objective: Clinicians in mental healthcare have few objective tools to identify and analyze their patient's care needs. Clinical decision aids are tools that support this process. This study examines whether 1) clinicians working with a clinical decision aid (TREAT) discuss more of their patient's care needs compared to usual treatment, and 2) agree on more evidence-based treatment decisions.

Methods: Clinicians participated in consultations (n = 166) with patients diagnosed with psychotic disorders from four Dutch mental healthcare institutions (research registration number 201700763). Primary outcomes were measured with the modified Clinical Decision-making in Routine Care questionnaire and combined with psychiatric, physical and social wellbeing related care needs. A multilevel analysis compared discussed care needs and evidence-based treatment decisions between treatment as usual (TAU) before, TAU after and the TREAT condition.

Results: First, a significant increase in discussed care needs for TREAT compared to both TAU conditions ($\beta = 20.2$, SE = 5.2, $p = 0.00$ and $\beta = 15.8$, SE = 5.4, $p = 0.01$) was found. Next, a significant increase in evidence-based treatments decisions for care needs was observed for TREAT compared to both TAU conditions ($\beta = 16.7$, SE = 4.8, $p = 0.00$ and $\beta = 16.0$, SE = 5.1, $p = 0.01$).

Conclusion: TREAT improved the discussion about physical health issues and social wellbeing related topics. It also increased evidence-based treatment decisions for care needs which are sometimes overlooked and difficult to treat. Our findings suggest that TREAT makes sense of routine outcome monitoring data and improves guideline-informed care.

1. Introduction

1.1. Clinical decision-making in mental healthcare

Clinical decision-making is a process in which clinicians identify the symptoms, needs and challenges of their patients and ideally integrate them with available medical evidence to reach an agreement on the most beneficial treatment (Joseph and Patel, 1990). Clinical decisions in mental healthcare are often characterized by incomplete and conflicting information, sometimes leaving outcomes prone to bias or personal preferences of clinicians (Fisher & Wennberg, 2003; Miller et al., 2015). Compared to other medical disciplines, clinicians in mental healthcare generally rely on observations and self-reports from their patients. It can be complicated to objectify these observed and reported symptoms using measurement instruments. Consequently, the process of clinical advice in mental healthcare is a complex combination of diagnostic skills and

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experience, while implications are hampered by the pragmatics of time constraints and the availability of resources (Bhugra et al., 2010). In sum, finding the right forms of treatment in mental health in general and psychosis care particularly, is often a complex and iterative process.

1.2. Care needs and routine outcome monitoring

Psychiatric symptoms, physical health issues, and challenges related to social wellbeing can remain unresolved and are therefore considered care needs that persist over time (Roebroek, L. O. et al., 2021). Treatment decisions ideally apply to psychiatric symptoms, somatic risk factors and issues related to social wellbeing (Tasma et al.,2016, 2017). Routine outcome monitoring (ROM) provides clinicians with information to identify these comprehensive care needs.

Routine outcome monitoring (ROM) uses standard validated instruments to systematically assess patient's health and well-being (Trauer, 2010). It can be challenging to integrate ROM results into daily clinical practice in mental healthcare. For example, in one study, only half of all clinicians actively used ROM results for feedback during consultations (de Jong, K. et al., 2012). In addition, certain needs identified by ROM, can remain undiscussed in the decisional process during consultations (Bhugra et al., 2011). Some attempts have been made to study the content of clinical encounters in psychosis care (Konrad et al., 2015; Hamann et al., 2008).

Psychiatric symptoms and medication are among the most frequently discussed topics: pharmacological treatments are about three times more likely to be discussed and initiated than non-pharmacological treatments (Hamann et al., 2008; Konrad et al., 2015). Psychosocial wellbeing (e.g. daytime activities, work, or social relations) are also frequently discussed. However, making treatment decisions in these domains is more challenging to implement and generally requires more time and effort (Konrad et al., 2015; Hamann et al., 2008). Also, physical health issues such as hypertension or anticholinergic side effects often remain unnoticed or undiscussed and, therefore, untreated, resulting in an increasing burden over time (Tasma et al., 2016; Tasma et al., 2017; Bruins et al., 2017; Roebroek, L. O. et al., 2021).

1.3. Clinical decision aids and treatment E-assist

Clinical decision aids (CDAs) are tools that support clinicians and patients when making healthcare decisions (O'Connor et al., 2005). They help address issues and needs during clinical encounters which might otherwise go unnoticed or remain undiscussed. Because there is a gap between guideline-informed care and actual clinical decision-making, CDAs can improve guideline implementation (Girlanda et al., 2017a). The use of CDAs in the treatment of severe mental illness is currently limited (Lamontagne-Godwin et al., 2020). Moreover, much of how clinicians and patients use CDAs during these encounters is unknown, as trials are often designed as a black box (Wyatt et al., 2014), not taking into account the content and process of the treatment plan consultations (Hargraves, Montori,2014).

The Treatment E-Assist (TREAT) application was developed to improve the use of ROM in daily clinical practice, to identify care needs, and to provide guideline implementation. This computerized clinical decision aid supports the decision-making process in the treatment of people with psychotic disorders. To our knowledge, TREAT is the first CDA to combine ROM results with official treatment guidelines and standards of care to provide personalized treatment advice for individuals in mental healthcare. The developmental process, pilot results, and qualitative assessment are published elsewhere (Tasma et al., 2018; Roebroek et al., 2020). TREAT uniquely displays the patients' identified care needs and evidence-based treatment recommendations, such as psychosocial interventions or changing medication (see supplementary for graphic representations). It can be used during clinical encounters in which treatment plans are drafted. We expect TREAT to improve and increase the number of identified care needs discussed during consultations. Furthermore, we expect TREAT to assist guideline implementation, resulting in a greater number of evidence-based treatment decisions.

1.4. Research aim

The aim of this study is to examine whether 1) clinicians working with a clinical decision aid (TREAT) discuss more of their patient's care needs compared to usual treatment, and 2) the use of this CDA (TREAT) results in a greater number of evidence-based treatment decisions.

2. Method

2.1. Setting, design and sample

Clinicians (n = 33) were recruited from four mental healthcare institutions in the Northern Netherlands, of which six never completed a single measurement, leaving 27 clinicians who actually participated in our study. Clinicians worked as psychiatrists (n = 13), psychologists (n = 3) or nurse practitioners (n = 11) in Flexible Assertive Community Treatment (FACT) teams (Drukker et al., 2013). Clinicians participated during treatment plan consultations with their patients. Clinicians received a brief training on how to use TREAT. Meetings were scheduled by the secretariat of participating teams. The patients had to be adults with a DSM-5 diagnosis of a psychotic disorder (295.90, 295.40, 295.70, 297.1, 298.8, or 298.9) (American Psychiatric Association,2013), who recently completed the local ROM screening called the Pharmacotherapy Monitoring and Outcome Survey (PHAMOUS) (Bartels-Velthuis et al., 2018). PHAMOUS is an annual screening and part of routine care for all patients with a severe mental illness receiving care in one of six mental healthcare institutions in the Northern-Netherlands.. Written informed consent was obtained from all patients. Clinicians were reminded by the research team about their upcoming scheduled meeting with the patient in which they were scheduled to discuss the outcomes of patients' recent ROM-PHAMOUS screening. In phase A and C this was a regular feedback meeting; in phase B it was enriched with information from TREAT.

An ABC study design was used for this study, which allowed for a comparison between pre and post exposure to the experimental condition (Kennedy,2005). In the first phase (A), all clinicians provided treatment as usual (TAU), in the second phase (B), the same clinicians worked with TREAT, in the third phase (C) all clinicians again provided TAU. TAU consist of regular treatment plan consultations in which the ROM results from the PHAMOUS screening are generally discussed. These results are summarized in a ROM letter which is send to the clinicians. In the TREAT condition, these same ROM results are graphically represented into care needs by the application and enhanced by treatment advice for these specific care needs. Intervention fidelity was examined by checking if TREAT reports were generated for all clinical encounters in the TREAT phase. Included clinicians had to participate with a minimum of 1 and a maximum of 4 consultations. Each treatment plan consultations featured different patients, patients were not allowed to feature more than once in the study. Based on a review by Stacey et al. (2017) , in which CDAs were tested against TAU, we calculated the power and concluded to need an approximate sample size of n = 81 consultations per trial phase (n = 243 consultations in total). We reasoned that a maximum of 4 consultations per phase and maximum of 12 consultations for the entire study would not burden clinicians to the point where they would participate and leave our study underpowered.

The Medical Ethical Committee of the University Medical Center Groningen (UMCG) approved this study (Research registration number 201700763, date January 9, 2018). The procedures of this research protocol were in accordance with local legislation and ethical standards as well as the Declaration of Helsinki. Data was collected from April 2018 until March 2020 (aborted by seven weeks due to the COVID-19 pandemic).

2.2. Care need outcomes

The outcomes of the PHAMOUS screening from patients that participated in the consultations of this study were used to identify their care needs. We used the TREAT algorithms to calculate 23 care needs on the psychiatric, physical and social wellbeing related domains (Tasma et al., 2018). Eight psychiatric symptoms (such as positive, negative and depressive symptoms) were calculated with scores from the Positive and Negative Syndrome Scale (PANSS) (Andreasen et al., 2005; Kay et al., 1987), an interview assessing clinical remission and the Health of the Nation Outcome Scale (HoNOS) (Pirkis et al., 2005), containing 12 items ranging from 0 (no problem) to 4 (severe problem) assessed by clinicians. Eight physical care needs (such as hypertension, hyperlipidemia and bodyweight) were calculated with the Subject Response to Antipsychotics questionnaire (SRA-34) (Wolters et al., 2006), a self-report questionnaire that measures (side) effects of pharmacotherapy containing 34 items on a 3-point scale. Physical indicators (i.e., blood pressure, BMI and waist circumference) and a blood test (glucose, hemoglobin A1c, LDL cholesterol, triglycerides and prolactin) were also included (Bartels-Velthuis et al., 2018). Seven care needs regarding social wellbeing (such as social relationships, housing and daytime activities) were calculated with the HoNOS (Pirkis et al., 2005) and the Manchester Short Assessment of Quality of Life (ManSA; (Priebe et al., 1999), a self-report questionnaire containing 16 items on a 7-point Likert scale. All care needs were dichotomized (no care need/care need) to yield an identical graphic representation as provided by TREAT for each participating patient in their consultation. The full calculation of all care needs can be found in the supplementary file. The PHAMOUS screening also provided the following information on demographic characteristic of the participating patients in each phase: age, illness duration, gender and diagnosis.

2.3. Clinical decision-making outcomes

We modified the *Clinical Decision-making in Routine Care* (CDRC) staff questionnaire (permission granted by the original authors (Konrad et al., 2015)), to assess aspects of clinical decision-making. The original version contains 12 categories, rated as either "not discussed", "discussed without a decision" or "discussed with a decision". The translated and modified version of the CDRC used for this trial contained the same 23 TREAT identified care needs. The feasibility of this modified questionnaire was tested during a pilot study and deemed appropriate (Tasma et al., 2018). The CDRC was filled in by clinicians directly after every consultation. Clinicians indicated which care needs were discussed and if/which treatment decisions were made for these needs. For each specific care need, it was scored whether the treatment decision was evidence-based.

2.4. Analysis

First, descriptive statistics were used to analyze patient characteristics. The sample characteristics of the patients in both TAU and TREAT conditions were compared using independent-samples t-tests (age, care needs and duration of illness) or Chi-Square ($\chi 2$) tests (gender and diagnosis), two-sided with a significance level of $\alpha = 0.05$. The percentage of discussed care needs in consultations (over identified care needs in the ROM assessment) was calculated. This was our primary outcome and we assumed to the percentage of discussed care needs would increase while using TREAT (phase B). We also assumed the percentage of evidence-based treatment decisions (over identified care needs in the ROM assessment), which served as our secondary outcome, would increase while using TREAT.

A multilevel analysis was used to compare the TAU conditions (A and C phase) to the TREAT condition (phase B). A two-level linear mixed model was built for both the primary outcome and secondary outcome measure. Clinicians were modeled as level 2, and patients were modeled as level 1. To account for the ABC design, both TAU 1 (1, 0, 0) and TAU 2 (0, 0, 1) were dummy coded and added to the model as fixed effects. A Random effect was added for the intercepts at level 2.

All statistical analyses were tested against a 0.05 significance level and performed using the Statistical Package of the Social Sciences (SPSS), version 27 (IBM,2021).

3. Results

3.1. Demographics and clinical characteristics

Clinicians participated with a total of 166 consultations, of which n = 65 in TAU 1, mean 2.4 consultations per clinician (A), n = 65 in the TREAT phase, mean 2.7 consultations per clinician (B), and n = 36 in TAU 2, mean 2.1 consultations per clinician (C). The unequal distribution can be attributed to the drop-out of clinicians (3 dropouts for the TREAT condition and 7 for the second TAU condition), with n = 17 clinicians completing the trial. These drop-outs were the result of job changes or because no patients from their caseloads who were scheduled for treatment plan consultations could be included. TREAT reports were generated for all 65 consultations in the TREAT condition, indicating appropriate intervention fidelity.

Compared to the overall population in regular PHAMOUS screenings, our sample contained slightly more men (69.9% vs 65.8%), was slightly older (49.2 vs 45.1), and had a longer average duration of illness (23.3 vs 17.6 years) (Bartels-Velthuis et al., 2018). No significant differences were found between phases in age, gender, or diagnosis (see Table 1a), except for more schizoaffective diagnosis disorder in the TREAT condition compared to TAU2. No significant differences were found in identified care needs between all phases (see Table 1a), which enabled a direct comparison between the three phases on the percentages of discussed care needs and the percentages of evidence-based treatment decisions (see Table 1b).

3.2. Discussed care needs

The percentage of discussed care needs in the TREAT condition (see Table 2) was significantly higher compared to both TAU conditions ($\beta = 20.2$, SE = 5.2, $p = 0.00$ and $\beta = 15.8$, SE = 5.4, $p = 0.01$) When

Table 1a
Demographics and clinical characteristics of participants (n = 166).

Demographics	TAU 1 Mean	TREAT Mean	TAU 2 Mean	*p*-value/ $\chi 2$
Age years (SD)	48.3 (9.5)	47.8 (10.8)	48.2 (11.8)	0.95
Gender male, % (n)	64.1 (41)	73.8 (48)	77.8 (28)	0.28
Illness duration years (SD)	23.6 (10.8)	19.7 (11.7)	24.5 (12.2)	0.09
Diagnosis % (n)	**TAU 1 Mean**	**TREAT Mean**	**TAU 2 Mean**	**$\chi 2$**
Substance induced	12.1 (8)	10.8 (7)	14.3 (5)	0.92
Schizophrenia	49.0 (32)	53.8 (35)	65.6 (23)	0.55
Schizophreniform Disorder	3.0 (2)	0 (0)	2.9 (1)	0.16
Schizoaffective Disorder*	22.3 (14)	12.3 (8)*	0 (0)*	0.06
Delusional Disorder	0 (0)	1.5 (1)	2.9 (1)	0.47
Psychosis NOS	4.5 (3)	6.2 (4)	0 (0)	0.31
Definitive diagnosis missing	9.1 (6)	15.3 (10)	14.3 (5)	0.58
Care Needs	**TAU 1 Mean**	**TREAT Mean**	**TAU 2 Mean**	***p*-value**
Psychiatric (range 0–8)	1.2 (1.2)	1.3 (1.1)	1.2 (0.98)	0.98
Physical (range 0–8)	3.7 (1.5)	3.9 (1.5)	3.8 (1.3)	0.74
Psychosocial (range 0–7)	1.2 (1.5)	1.2 (1.7)	1.2 (1.4)	0.99
Total (range 0–23)	5.7 (2.4)	6.1 (2.5)	6.0 (2.4)	0.68

SD = standard deviation.
* Significant difference between two conditions.

Table 1b
Percentage of patients with care needs (dichotomized) in all measurements (n = 166).

Psychiatric Care Needs	Need %	Discussed %
Positive Symptoms	41.3	93.5
Negative Symptoms	41.1	81.0
Substance Use	28.8	73.7
Depressive Symptoms	16.0	83.3
Anxiety	12.8	73.7
Agitation	0	0
Compulsive Symptoms	1.5	0
Self-harm	1.5	100
Psychiatric total average	15.3	83.3
Physical Care Needs	Need %	Discussed %
Bodyweight	91.3	61.6
Hyperlipidemia	78.0	61.2
Smoking	59.4	59.8
Anticholinergic Side Effects	57.9	17.1
Hypertension	51.0	45.6
(Pre)diabetes Type II	50.9	46.4
Sexual function disorder	50.4	50.0
Movement disorder	39.6	44.7
Physical total average	47.1	49.3
Social Wellbeing Care Needs	Need %	Discussed %
Sexuality	29.7	62.9
Social relationships	26.6	83.8
Housing	21.6	70.0
Daytime activities	13.8	89.5
Intimacy	21.1	69.2
Personal safety	11.3	57.1
Family support	6.5	87.5
Social wellbeing total average	17.4	75.9

Table 2a
Total mean scores discussed care needs percentages.

	TAU 1 Mean (SD)	TREAT Mean (SD)	β (95% CI)	*p*-value
Discussed total % **	51.1 (27.4)	70.4 (23.2)	20.2 (9.3, 31.1)	0.00**
Discussed psychiatric %	77.3 (35.1)	89.7 (27.9)	15.0 (−1.8, 32.0)	0.08
Discussed physical % **	38.3 (34.2)	62.0 (31.7)	24.5 (13.6, 35.4)	0.00**
Discussed social wellbeing %	72.2 (37.9)	86.1 (28.1)	13.9 (−3.7, 31.6)	0.12
	TREAT M (SD)	**TAU 2 M (SD)**	**β (95% CI)**	***p-value***
Discussed total % *	70.4 (23.2)	55.6 (25.1)	15.8 (4.0, 27.6)	0.01*
Discussed psychiatric %	89.8 (27.9)	80.6 (35.0)	11.2 (−3.4, 25.8)	0.13
Discussed physical %	62.0 (31.7)	45.9 (31.7)	15.6 (−0.4, 31.6)	0.06
Discussed social wellbeing % *	86.1 (28.1)	64.3 (37.7)	21.8 (1.0, 42.6)	0.04*

SD, standard deviation.
* significant at $p = 0.05$.
** significant at $p = 0.01$.

analyzing the subdomains no differences were found between the percentage of discussed psychiatric care needs between TREAT and both TAU conditions (β = 15.0, SE = 8.4, $p = 0.08$ and β = 11.2, SE = 7.3, $p = 0.13$). A significant increase was found between TAU 1 and the TREAT condition in discussed physical care needs (β = 24.5, SE = 5.5, $p = 0.00$) but a non-significant difference was found between the TREAT and TAU 2 condition (β = 15.6, SE = 8.0, $p = 0.06$). A non-significant effect was observed in the percentage of discussed care needs regarding social wellbeing being between TAU 1 and the TREAT condition (β = 13.9, SE = 8.9, $p = 0.12$), but a small significant increase in the percentage of discussed care needs regarding social wellbeing between TREAT and TAU 2 was observed (β = 21.8, SE = 10.4, $p = 0.04$).

Table 2b
Total mean scores of percentages of evidence-based treatment decisions (EVB).

	TAU 1 Mean (SD)	TREAT Mean (SD)	β (95% CI)	*p*-value
EVB treatment total % **	18.3 (21.4)	33.4 (32.0)	16.7 (6.9, 26.6)	0.00**
EVB psychiatric %	23.2 (37.9)	28.2 (41.9)	4.7 (−12.7, 22.0)	0.60
EVB physical % **	16.5 (24.6)	34.1 (33.7)	19.6 (8.2, 31.0)	0.00**
EVB social wellbeing % *	4.6 (15.2)	15.0 (32.5)	11.5 (1.55, 16.6)	0.02*
	TREAT M (SD)	**TAU 2 M (SD)**	**β (95% CI)**	***p-value***
EVB treatment total % **	33.4 (32.0)	19.3 (20.2)	16.0 (5.4, 26.7)	0.00**
EVB psychiatric %	28.2 (41.9)	24.3 (36.1)	4.1 (−15.4, 23.5)	0.68
EVB physical % **	34.1 (33.7)	20.3 (25.2)	15.9 (4.9, 26.9)	0.00**
EVB social wellbeing %	15.0 (32.5)	7.7 (15.3)	4.7 (−7.3, 16.6)	0.44

SD, standard deviation.
* significant at $p = 0.05$.
** significant at $p = 0.01$.

3.3. Evidence-based treatment proposals

The percentage of evidence-based treatments decisions for care needs was significantly higher in the TREAT condition (see Table 2) compared to both TAU conditions (β = 16.7, SE = 4.8, $p = 0.00$ and β = 16.0, SE = 5.1, $p = 0.01$). On the subdomain of psychiatric care needs no significant differences were observed between both TAU and the TREAT condition (β = 4.7, SE = 8.7, $p = 0.60$ and β = 4.1, SE = 9.8, $p = 0.68$). The percentage of evidence-based treatment decisions for physical care needs was significantly higher in the TREAT condition compared to both TAU conditions (β = 19.6, SE = 6.2, $p = 0.00$ and β = 15.9, SE = 7.1, $p = 0.00$). A significant effect of TREAT on the percentage of evidence-based treatment decisions for identified care needs regarding social wellbeing was observed compared to TAU 1 (β = 11.5, SE = 4.9, $p = 0.02$), but not between the TREAT and TAU 2 (β = 4.7, SE = 6.0, $p = 0.44$).

4. Discussion

The first aim of this study was to examine whether clinicians working with the clinical decision aid (CDA) named Treatment E-Assist (TREAT) discuss more of their patient's care needs compared to usual treatment. A multilevel analysis revealed a significant increase in the number of identified care needs being discussed when TREAT was used. These results confirm findings from a qualitative assessment in which most clinicians indicated that TREAT made routine outcome monitoring data (ROM) easier to discuss during clinical encounters due to improved structure of the report and a more appealing graphical representation of the data, which subsequently improved the discussion with patients over prevalent issues (Roebroek et al., 2020).

As was found in other studies (Hamann et al., 2008; Konrad et al., 2015), existing psychiatric care needs were most frequently discussed in clinical encounters. TREAT did not significantly increase the number of psychiatric needs being discussed in the consultations. One could argue that psychiatric needs have always been the focus of treatment for severe mental illness. Therefore, a clinical decision aid such as TREAT does not affect these often discussed needs. In contrast, physical care needs are highly prevalent and may remain undisclosed and untreated in psychosis care (Tasma et al.,2016, 2017; Bruins et al., 2017). This was confirmed by our results, as physical care needs account for more than half of all needs, yet are discussed significantly less often compared to psychiatric (34.0%) and social wellbeing related care needs (26.6%). Our findings suggest that TREAT shifts the conversation more towards

physical or social wellbeing related needs, for example by initiating conversations about sensitive or intimate topics which might otherwise have remained undiscussed (Roebroek et al., 2020). These topics are important as cardio-metabolic risk factors as well as social isolation and loneliness are known to contribute to a lower quality of life and severely reduced life expectancy (Laursen et al., 2012; Michalska da Rocha et al., 2017; Fleischhacker et al., 2008).

The second aim of this study was to examine whether clinicians working with TREAT agree on more evidence-based treatment decisions compared to usual treatment. Research synthesis and guideline development in mental healthcare is an advanced and well-developed process, but the dissemination of evidence-based guidelines into daily clinical practice is much less organized and lagging behind (Girlanda et al., 2017a). With TREAT, an active strategy was developed to improve the implementation of guidelines in psychosis care. The use of TREAT resulted in a significant increase in the number of evidence-based treatment decisions for identified care needs compared to usual treatment. The first potential reason for this increase is the evidence-based treatment recommendations. While some clinicians actively used the recommendations during their consultations, others felt they had sufficient knowledge about existing treatment options (Roebroek et al., 2020). An alternative explanation could be the graphic representation of identified care needs by TREAT. Issues that might otherwise be overlooked are now more actively discussed and a course of action for treatment could then be suggested.

No significant differences were observed for psychiatric needs, but the number of evidence-based treatment decisions for physical needs nearly doubled. The number of evidence-based treatment decisions for social wellbeing-related needs was considerably lower. Fewer evidence-based psychological interventions are sometimes available for these needs in regional care, for example due to lack of trained practitioners. While other forms of organized care such as community centers or assisted living accommodations are not within the scope of this study, these needs can be accommodated. As a results, TREAT has fewer recommendations for social wellbeing-related needs compared to recommendations for psychiatric and physical needs. Nevertheless, a threefold increase was observed when TREAT was used compared to usual treatment before the intervention.

4.1. Clinical implications

TREAT changed the content of the conversations by addressing a wider array of topics such as physical health issues and challenges related to social wellbeing, that would otherwise go unnoticed in treatment plan meetings (Konrad et al., 2015). For example, cardio-metabolic risk factors associated with the use of antipsychotic medication are notoriously difficult to treat (Bruins et al., 2017; Bak et al., 2014). ROM can be used to monitor these risk factors, but the results do not always translate to actions in daily clinical practice (Tasma et al.,2016, 2017). Combining ROM with progress feedback has the potential to improve patient outcomes in clinical practice (de Jong et al., 2021). TREAT facilitates this process by improving the integration of ROM results in consultations, leading to more discussed care needs, especially the physical ones, which are most prevalent and often insufficiently considered. Increased negotiation with personalized treatment recommendations resulted in an increase in evidence-based treatment decisions. In this way TREAT also contributes to the implementation of guidelines that have the potential to improve clinician's performance and patient outcomes in mental healthcare (Girlanda et al., 2013; Barbui et al., 2014). Where previous efforts of guideline implementations often failed to increase adherence (Girlanda et al., 2017b), TREAT offers a practical, real-world implementation blueprint for precision medicine and guideline implementation in psychosis care. It has to be noted that patient knowledge and preferences as well as the sharing and discussion of this input are an essential part of the decisional process. In this trial the effects of TREAT on shared decision-making and their overall satisfaction with consultations will also be examined from a patient point of view. These results are published in a separate paper.

4.2. Strength and limitations

To our knowledge, this is the first study in psychosis care to evaluate the effects of a CDA on clinical decision-making. Our results contribute to the literature on decision support in general and in particular in psychiatry where deployment of CDAs is still limited (Lamontagne-Godwin et al., 2020). This study presents an effective way to improve the incorporation of ROM results in daily clinical practice.

Furthermore, an active and effective strategy for guideline implementation during clinical encounters is demonstrated. With 27 clinicians from four different mental healthcare institutions participating with 166 different patients in their clinical encounters during two years, we managed to collect a diverse and representative clinical sample of clinicians working in psychosis care. With the ABC design we were able to demonstrate that after clinicians stopped working with TREAT their discussion of care needs and evidence-based treatments dropped back to pre-intervention levels. These findings support the continuous use of CDAs such as TREAT.

A potential limitation of this study is a possible selection bias in participating clinicians. We tried to recruit clinicians who were skeptical towards TREAT, but we cannot rule out an oversampling of clinicians with more favorable attitudes. Many CDAs are used suboptimal in clinical encounters (Wyatt et al., 2014), we checked if TREAT reports had been generated by clinicians for the corresponding consultations, but no additional observations were made to assess intervention fidelity. To test whether the use of TREAT can indeed lead to more effective treatment, an RCT is necessary. With regards to the therapeutic relationship which tends to develop over a series of clinical encounters, it might also be wise to test TREAT in multiple consultations with the same patient.

4.3. Conclusions

This study examined the effects of TREAT, a clinical decision aid in psychosis care, on clinical decision-making. We expected TREAT would improve discussion about existing care needs and increase the number of evidence-based treatment decisions for those needs. TREAT improves discussion about physical and social wellbeing-related care needs. It also increased the number of evidence-based treatment decisions for physical needs, which otherwise can remain untreated. TREAT improves the integration of ROM results in daily clinical practice while at the same time serving as guideline implementation. Our findings add to the limited knowledge about decision support in mental healthcare and provide a real-world example for the implementation precision medicine in psychosis care.

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Author contribution

LR: conception and design of the study, organizing and conducting the trial and the data collection, wrote the draft article, data analysis and interpretation. JB: conception and design of the study, data analysis and interpretation, critical review of the manuscript. PD: conception and design of the study, data analysis and interpretation, critical review of the manuscript. AB: conception and design of the study, data analysis and interpretation, critical review of the manuscript. SC: conception and

design of the study, data analysis and interpretation, critical review of the manuscript. WV: conception and design of the study, data analysis and interpretation, critical review of the manuscript. FJ: conception and design of the study, data analysis and interpretation, critical review of the manuscript. ES: conception and design of the study, data analysis and interpretation, critical review of the manuscript. All authors have read and approved the final version of this manuscript.

Data availability

The data that support the findings of this study are available from the corresponding author LR upon reasonable request.

Declaration of competing Interest

The authors declare they do not have any conflicting interests.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychires.2022.10.053.

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