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Research Paper

Cost difference between treatment with long-acting injection and oral antipsychotics in schizophrenia: prospective study in NHS, UK population

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ABSTRACT

Objective: The present study aims to compare long acting injection antipsychotic and oral antipsychotics in reducing the overall cost of treatment. ***Method:*** The data for the present study was extracted from the primary data collected for a Pragmatic, Multicenter, Phase III Randomized Control Trial (IMPaCT). The patients who were treated with antipsychotics at baseline were selected from the IMPaCT study data set. The patients were divided into two cohorts based on their mode of antipsychotic administration: Oral cohort and Long acting injection cohort. The primary outcome were difference health and social care and social care costs in oral and LAI cohort. ***Results:*** Data for 195 patients was extracted from the IMPaCT study database. 153 (78.4%) patients met the criteria for oral cohort and 42 (21.5%) patients were assigned to the depot cohort. Mann-Whitney U test showed no significant difference between the two cohorts in health and social care cost at 12 months follow up. (p=0.995). Furthermore, there was no difference in societal costs between the cohorts. (p=0.55). ***Conclusion:*** The results from the present study suggest that the costs associated with treatment of Long acting injection antipsychotic is comparable to costs in treatment with oral antipsychotics.

Keywords: *Schizophrenia, Long Acting Injection, Antipsychotics, Cost of Treatment, Oral Antipsychotics, Depot*

Schizophrenia, prevalent in approximately 1% of the UK adult population, characterized by severe and chronic symptoms remains a challenge for the health care services providers, health researchers and policy-makers.[1] Antipsychotic therapy has been indicated as the primary choice of treatment for schizophrenia, supported by leading American Psychological Association, National Institute of Mental Health and National Institute for Clinical Excellence. However, absolute non-compliance or partial compliance to antipsychotic therapy is common in schizophrenia and is a strong predictor of worsening symptoms[2], augmented chance of relapse, hospitalization and further resistance to antipsychotic treatment.

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With nearly 3% expenditure of the total NHS cost accounted treatment of schizophrenia, in the prevention of relapse, hospitalization and pharmacy costs, it contributes to a huge economic burden on the patients, care takers and employers but also the larger society in general.[3] While medication costs only contribute to a small proportion of the total treatment costs (1-6%), a major part of the treatment cost is a result of hospitalization and other in-patient care (79%).[4] In efforts to improve adherence and consequently reduce the risks of relapse and hospitalization, Long Acting Injection were introduced in 1966 by pharmaceutical company Squibb and sons. Depot are intramuscularly administered once in every 1-6 weeks and require the patient to visit the clinic for administration, eliminating the need for daily oral antipsychotic administration.[5]

The administration of depot by the clinicians provides an advantage of being in close contact with the patients and provide follow-up if an appointment is missed, which is likely to increase adherence to treatment, and consequently reduce relapse and hospitalization. The potential advantages of Long Acting Injection (LAI/Depot) antipsychotic therapy look promising in reducing the economic burden of this big budget problem. However, inconsistencies in the results of studies comparing cost effectiveness of oral and depot antipsychotic therapy limit our understanding of any true benefit of using depot antipsychotics.

The incoherence in the results are partially explained by different methodological approaches used in the studies to answer the same question.[6] For example: Mirror study, conducted by Peng, et al6 assessing the change in the level of adherence, hospitalizations and direct cost of care in 147 patients diagnosed with schizophrenia, 6 months pre-and-post depot initiation favored the superiority of LAI. The rate of adherence increased to 60% adhering to depot antipsychotic as compared to only 36% pre-depot initiation ($p<0.001$). A significant decrease in hospitalizations and inpatient cost was also observed post initiating depot. Another study conducted by Niaz and Haddad, 2007 in their 35-week retrospective study recruiting patients (n=74) with schizophrenia examined the effect of atypical depot antipsychotic, Risperidone Long Acting injection (LAIR) on rate of hospitalization and overall treatment costs.[8] Moreover, a longitudinal cohort comparing the same antipsychotic formulation in form of oral and depot antipsychotic indicated that depot antipsychotics are advantageous in reducing the overall cost of treatment by improving the adherence to medication. [10]

The results indicated a significant decrease in the admission rate of patients administered LAIR. The financial saving from reduction in hospitalization also exceeded the acquisition and administration cost associated with LAIR.

In contrast to pragmatic studies, majority of exploratory Randomized control trials comparing the effectiveness of depot and oral antipsychotics have observed either no difference between the two modes of administration, or LAI has been associated with higher cost of treatment. In a randomized controlled trial conducted in veteran health administered patients, patients randomized to the LAI group had significantly more total cost of treatment as compared to the oral antipsychotic group. [9]

Even though RCTs are considered the gold standard of predicting the efficiency of a new treatment, they may not appropriate address a more real-life phenomenon such as adherence. Furthermore, mirror studies are likely to have an inherent bias towards improvement. Thus,

prospective or retrospective observational studies can be considered more accurate in addressing adherence and consequent change in cost.[7]

It is also important to define the core contributors in the treatment cost of schizophrenia. The direct costs (costs related to the treatment administration; such as, inpatient and outpatient costs, drug costs, lab costs etc.) and the indirect costs (consequent cost due to illness; comprising of loss of productivity in patients and caregivers, and benefit costs) are both contributory to the economics of schizophrenia. While, the direct costs of treatment are easily reported and can be extracted from clinical records and clinical database, indirect costs need a more specialized mode of evaluation and are recorded through self-report questionnaires. [11]

There has been considerable argument regarding the best measure of data collection for resource utilization. Number of studies comparing the cost effectiveness of treatment extract their data from clinical records and big databases, which may not record or accurately report the indirect costs of treatment.[12] This may limit the results and not reflect the overall treatment cost in the real world. It is also favorable for the policy makers to compare the treatment costs from a broader and societal perspective.[13]

The aim of the present study is identifying the difference in cost effectiveness of antipsychotic therapy using different two distinct modes of administration, from a broader and societal perspective by including both direct and indirect cost. Moreover, the study adapted a prospective design to answer the question of comparable cost effectiveness between the two treatments.

METHODOLOGY

Objective

The present prospective cohort study aimed to compare the cost effectiveness of administering Long Acting Injections versus Oral antipsychotics in a sample of patients diagnosed with Schizophrenia, schizoaffective disorder and also a subgroup of bipolar disorder (ICD-10). The secondary aim of the study was to analyze difference between the costs in patients treated with frequently used oral antipsychotic clozapine and patients treated with other oral antipsychotics and Long acting injections as a group.

Data Collection

The data for the present study was extracted from a multicenter, longitudinal, pragmatic phase III Randomized Control Trial, IMPaCT. The primary data collection took place within the consenting community mental health teams at 4 different centers (South London and Maudsley NHS Foundation Trust, Oxleas NHS Trust, or Sussex Partnership NHS trust)13. Care coordinators within the CMHTs were approached by the researchers in a random sequence and consented to participate in the trial. The patients were randomly selected from the care coordinator's list and approached to participate in the study. The baseline assessments were then carried out by trained research assistants for the consented participants. The care coordinators were further randomized to the control group (treatment as usual) or intervention group (training to support to deliver health promoting intervention) to assess the primary aim of the IMPaCT study13,14. The patients were followed up were carried out twice at 12 months and 15 months after baseline. The assessments used at baseline were again carried out at the follow-up time points.

Funding and Ethical Approval

The randomized control trial was funded by the National institute for Health Research. (Gaughran et al, 2013). The ethical approval for the IMPaCT RCT was obtained from The Joint South London and Maudsley and The Institute of Psychiatry NHS Research Ethics Committee. (REC reference number 09/H080/41).[13] The study followed the regular ethical protocol. All the patients in the trial were consented and informed that they were free to withdraw from the study at any given time throughout the study. The patients were given a unique identification number to maintain the confidentiality of data.

Participants

The data for 195 patients was extracted from a data pool of 406 patients in the IMPaCT. The selection of the participants was based on the administration of antipsychotics at baseline.

Inclusion criteria for the study population of either study included that patients be of age between 18-65 years, have a psychotic disorder including ICD 10 diagnosis F20-29, F31.2, F32.3, F33.3, and are registered on the enhanced level of the Care Approach Programme (CPA) or equivalent.

The study excluded patients with first episode of psychosis, patients with primary diagnosis of learning disability, physical health problem that will independently impact on metabolic measures and substance use, patients who were pregnant, mothers who were 6 months post-partum during the study, patients with life threatening or terminal medical conditions in which intensive care is already provided.

Since the data was extracted from the IMPaCT study, the inclusion and exclusion criteria were selected as were suitable for the purpose of IMPaCT trial.

Measurements and Scales

Sociodemographic measures: The sociodemographic measures gathered information for age, gender, ethnicity, living arrangements, relationship status, number of children and ICD 10 diagnosis.

Client Service Receipt Inventory: Client Service Receipt Inventory Questionnaire, first developed by Knapp and Beecham is a self-reported tool to collected information on direct and indirect costs of treatment. The questionnaire is an established tool of data collected and has been used in many cost-of-illness studies. CSRI is administered retrospectively and the retrospective period is fixed based on the objective of the study. It is therefore adaptable in various study designs and is advantageous in capturing information on the rare service utilization and other cost-related variables. The data for the present study was extracted based on an adapted version of CSRI used in the IMPaCT trial[14]. The adapted CSRI covered the service utilization in 4 main domains: a) All cause secondary and community-based health and social care services b) prescription medications c) time off work d) security benefits received by participants and care givers. The assessment was conducted as a face-to-face interview administered by an assessor blind to IMPaCT study treatment allocation. The fixed retrospective period of all service utilization was 6 months at baseline and 12 months and 3 months at 15 months follow up.[14]

Unit Costs: Unit costs were allocated to resource utilization data collected from CSRI for each patient to compute the total costs Unit costs for most hospital and primary care services

and the unit costs of Health and Social Care were obtained from the NHS Reference Costs (inflated to 2011-12 prices using the Hospital and Community Health Services Pay and Prices Index or Retail price index as appropriate).[14] Additionally, British National Formulary was taken as the reference for Medication use cost. The costs from the formulary were converted into cost per milligram. Choosing the most reasonable pack size, using generic formulation over branded ones and using cost estimated for maintenance doses over initial treatment dose were implemented to obtain more economical estimates. Lost productivity costs were estimated using the human capital approach by applying national average wage rates to lost work days capped at 5 days per week.

Procedure

The primary criteria used to determine the inclusion of patient data in the present study was the administration of either oral or depot antipsychotics at baseline. For the primary objective evaluating cost effectiveness between oral and LAI, the patients were divided into two cohorts based on their treatment with oral antipsychotic (Oral cohort) or LAI antipsychotics (Depot Cohort). The difference in costs between the two cohort groups were analyzed for the 12-month follow-up data. The secondary objective of the study was to analyze the difference between costs of patients treated with clozapine versus other antipsychotics regardless of their mode of administration. To address the secondary hypothesis patients were divided into two groups a) patients treated with clozapine b) patients treated with other antipsychotics (LAI and Oral antipsychotics considered as one group). Similar to the procedure for the primary objective, the two groups were analyzed for any difference in their costs at 12-month time period. The 15-month follow-up data was not included in the analysis due to certain missing data points and brief time difference between 12 and 15 months.

Statistical Analysis

Sociodemographic factors: age, gender, ethnicity, living arrangements, relationship status, number of children and ICD Diagnosis were compared between the two cohort groups using Descriptive statistics; Chi square and t test, where applicable. Normality of the cost variables (health and social care costs; and societal care costs at 12 months follow up) was analyzed Kolmogorov-Smirnov Test. Mann-Whitney U test was performed for the comparison of the means. Bivariate correlation (Spearman rho) were run between cost variables at baseline and at 12 months for the same cost category to control for confounding in the outcome cost variables (Health and social care cost; and societal cost at 12 months) due to baseline cost variables. Correlation between baseline medicine and health and care costs; and societal cost at 12 months to control for the effect of high medicine cost at baseline. Multiple regression model controlling for age, and same cost category at baseline and medicine cost at baseline where applicable was used to calculate the independent effect of mode of administration on the cost outcomes. For the secondary hypothesis, Mann-Whitney U test was performed for the comparison of the mean of costs between clozapine and other antipsychotics and Multiple regression model controlling for age, and same cost category at baseline and medicine cost at baseline where applicable, was used to calculate the independent effect of clozapine on the costs.

A p value of 0.05 was used to determine the level of statistical significance. All statistical analyses were carried out using SPSS Version 24.

Sample Population

In total, data for 195 patients was extracted from the IMPaCT study data base. The mean age for the total patient population was 43.36 at baseline (SD: 9.137). The number of males (n=124) patients was more than the female patients (n=71) in the sample. White male patients contributed to majority of the sample population. Black Caribbean ethnic group (n=94) were the majority minority ethnic group in the study sample. Furthermore, majority of the patients in the sample were single (n=127), had no children (n=122) and lived alone (n=101). Moreover, study sample comprised of 148 patients diagnosed with schizophrenia, 29 patients undergoing treatment for schizoaffective disorder and 16 patients diagnosed with bipolar disorder. Only 2 patients of the total sample had diagnosis of unspecified and other non-organic psychosis.

RESULTS

Table 1: Demographic Characterstics of participants at baseline for each cohort group.

		Mode of administration				Clozapine			
		Oral		depot		Other Antipsychotics		Clozapine	
		Mean	Count	Mean	Count	Mean	Count	Mean	Count
Age at baseline		42.91		45.03		44.48		41.50	
Gender	Male		95		29		76		48
	Female		58		13		46		25
Ethnicity (5 groups)	White		75		19		54		40
	Black Caribbean		45		12		39		18
	Black African		16		9		18		7
	Asian		5		1		3		3
	Mixed and other		12		1		8		5
Who do you live with	Homeless		0		0		0		0
	None of the above (specify)		2		0		0		2
	Other (unrelated)		3		2		5		0
	Spouse/Partner		6		3		8		1
	Child or children		9		0		7		2
	Spouse/Partner and child or children		9		1		7		3
	Other relatives		11		3		7		7
	Supervised/Assisted living		35		10		25		20
	Alone		78		23		63		38
Relationship status	Widowed		1		1		1		1
	Married/Living with someone		15		5		17		3
	In a steady relationship		18		3		10		11
	Divorced/Separated		19		6		17		8
	Single		100		27		77		50
Number of children	0		98		24		74		48
	1		21		9		15		15
	2		24		1		16		9
	3		6		4		10		0
	4		1		1		2		0
	5		3		2		4		1
	6		0		1		1		0

Data for the 195 patients administered antipsychotics at bassline was extracted from the IMPaCT trial data base. Out of the 195 patients, only 42 patients met the criteria of LAI cohort and 153 met the Oral antipsychotic cohort criteria.

No significant difference in the baseline characteristics between the LAI and Oral cohorts was observed for the age(p=0.506), gender (p=0.407), ethnicity (p=0.313), living conditions(p=0.580), relationship status (p=0.763), number of children (p=0.106) and ICD10 diagnosis (p=0.098). Out of the total sample, 73 patients were treated with clozapine. Clozapine was the most common oral antipsychotic used in the sample.

Similarly, no significant difference in age (p=0.874), gender (p=0.627), ethnicity (p=0.517), living conditions (p=0.100), relationship status (p=0.138), number of children (p=0.114) and ICD10 diagnosis (p=0.686) was observed for patients administered clozapine versus other antipsychotics.

Outcome and costs

Table 2: Mean Rank difference for mode of administration in health and social care cost

	Mode of administration	N	Mean Rank	Sum of Ranks
Health and social care cost	Oral	153	98.01	14996.00
	depot	42	97.95	4114.00
	Total	195		

Table 3: Mean Rank difference for mode of administration in societal cost

	Mode of administration	N	Mean Rank	Sum of Ranks
Societal cost	Oral	153	99.27	15188.00
	depot	42	93.38	3922.00
	Total	195		

Table 4: Mean Rank difference for mode of administration in health and social care cost

	Clozapine	N	Mean Rank	Sum of Ranks
Health and social care cost	no	122	94.41	11518.00
	yes	73	104.00	7592.00
	Total	195		

Mann-Whitney indicated that the health and social care cost for oral cohort (Mean= 98.01) was not significantly different than depot cohort (Mean=97.95). (Mann-Whitney U= 3211.0, n1= 43, n2= 122, p=0.995 two tailed). Moreover, mean rank values in oral group and depot group were 99.27 and 93.38 for the societal cost. Although the mean rank value for depot cohort was lower than the oral cohort, this difference was not significant. (Mann-Whitney U= 3019.00, p=0.55). Bivariate correlation between cost variables at baseline and 12 months indicated a significant correlation. (Health and social care at baseline and health and social care at 12 months: r=o.676, p<0.01; societal cost at baseline and societal cost at 12 months: 0.668). A weak correlation was also observed between medicine cost at baseline health and social care cost at 12 months (r=0.037, p=0.150).

A 2-stage hierarchical multiple linear regression in was conducted with Health and social care cost as the independent variable. Age, health and social care cost at baseline and

medicine cost at baseline were entered at stage one of the regression to control for the effect of age, health and social care cost; and medicine cost at baseline. Depot administration was entered at stage two. The effect of depot administration was insignificant on the health and social care cost. (R square change= 0.07, F Change=1.767, F change p=0.162). Likewise, hierarchical multiple linear regression controlling for age and societal cost at baseline indicated that the administration of depot had no significant effect on societal cost. (R square change= 0.007, F change= 1.970, F change p=.162).

Analyzing the secondary outcome, patients administered clozapine (Mean Rank=104.00) did not significantly differ from the patients administered other antipsychotics (Mean Rank= 94.41) in terms of Health and social care costs. (Mann-Whitney U=4015.00, n1=73, n2= 122, p=0.251 two tailed). Furthermore, no significant difference in the societal costs was observed in the two groups. (Mean rank clozapine = 97.52, Mean Rank other antipsychotics= 98.29, Mann-Whitney U test= 4418.00, p=0.927 two tailed). The results from multiple linear regression confirmed the results of Mann-Whitney U test as clozapine administration did not have any significant effect on Health and social care cost (R square change= 0.00, F Change=0.68, F change p=0.795) or societal cost (R square change= 0.001, F change= .275, F change p=.601).

DISCUSSION

The prospective longitudinal cohort study aimed to compare the cost effectiveness of oral and depot antipsychotics in patients diagnosed with schizophrenia. Besides, the secondary objective was to compare the difference in costs between patients treated with clozapine and patients treated with other antipsychotics.

In our best knowledge, this is the first prospective cohort study that uses the self-report as a measure to analyze costs differences in patients treated with long acting injections and oral antipsychotics. The study takes into consideration both direct cost of service utilization and indirect costs due to lost productivity and benefit costs, and evaluates the total cost from a broader perspective.

The main finding of the study was the treatment of LAI antipsychotics had the same effects on health and social care costs as the treatment with oral antipsychotics. No significant difference in health and social service cost between the two cohorts, indicated that patients treated with oral antipsychotics have the same level of health service utilization and affiliated costs as patients treated with depot antipsychotics. Furthermore, difference between oral and depot cohort were insignificant in terms of difference in societal costs. Thus, treatment with depot antipsychotics was not superior to treatment with oral antipsychotics in reducing societal cost due to lost productivity and vice versa.

Various possible justifications can be considered for the apparent lack of difference between treatment with oral and depot antipsychotics in cost reduction if any such difference exists.
Firstly, Depot medications are thought to be superior to oral antipsychotics in reducing costs of treatment, by assuring adherence and preventing relapse and hospitalization.[2,6] Our study did not include any measure of adherence while comparing the two cohorts. Furthermore, the data for the present study was extracted from the primary data collected for a pragmatic control trial and the patients involved in the study were selected from community mental health teams thus, may include Hawthorne effect. Non-compliance to medication is associated with severity of symptoms; The patients selected from the community mental

health team, consenting to participate in the study may relatively adherent to the treatment. The possibility of equal adherence to treatment can be inferred as equal risk of hospitalization and relapse, consequently leading to equal health care and social care resource utilization. A five-year historical cohort compared the rate of relapse in patients treated with atypical antipsychotics and typical antipsychotics. [17] Results from the longitudinal study indicate that the patients treated with atypical oral antipsychotics relatively prolonged period between successive remissions as compared to patients treated with typical long acting injections indicating comparable efficacy of oral and depot antipsychotics as opposed to the previous studies.

Secondly, since the study had an observational design, the mode of antipsychotic administration was based on psychiatrist's choice of treatment. We did not have sufficient information to determine the reason for depot or oral antipsychotic prescription and other factors such as concomitant medication, use of service outside community healthcare, contributory to the total treatment costs. Moreover, CSRI captured 6 month's time period at baseline and 12 months, we did not have any information regarding the total time length of their prescribed treatment and its effects. Also, since the patients included in the study were selected from community care services, they were likely to have mild symptoms even at baseline and thus, less room for improvement with either therapy. There were no measures to testify this assumption as the study was aimed to assess the as cost of illness and did not take into consideration the symptom severity.

Whilst, observational studies have demonstrated superiority of depot antipsychotics in improving the inpatient treatment costs by reducing the rate of relapse, they have also indicated that use of depot was associated with increase in outpatient care cost as depot antipsychotics are more expensive. A longitudinal retrospective cohort conducted in patients diagnosed with schizophrenia in the veteran population, compared the health care utilization and related costs between patients treated with Paliperidone palmiate long acting injection and patients treated with other antipsychotics. [18] The results of the study indicated that patients treated with Long acting injection paliperidone palmiate had lower inpatient and admission costs. However, regardless of reduced inpatient and admission cost, no significant difference was observed between the two cohorts in the total cost of treatment at 12 months. Additionally, Yantham et al20, compared the safety and tolerability of Long Acting Injection Risperidone in patients diagnosed with bipolar disorder. The results from the study indicated that LAIR and atypical antipsychotics were similar in terms of effectiveness, safety and tolerability. No benefits of long acting injections over oral atypical antipsychotics were observed. Lastly, it can also be assumed that there may not be any real difference between oral and depot antipsychotics in terms of their economic effectiveness.

Addressing the secondary objective of the study, no significant differences were observed in the cost effectiveness of Clozapine and other antipsychotics. Both Clozapine and Long acting injections have been considered as excellent treatment option for patients with severe symptoms. A study compared the risk of readmission in patients treated with haloperidol Fluphenazine and haloperidol decanoate and Serotonin-Dopamine Antagonists, clozapine, risperidone and olanzapine. [20] The results from the study indicated that the SGAs were at least comparable to haloperidol Fluphenazine and slightly lower rate of readmission that haloperidol deaconate. Indicating the similar effects of LAI and clozapine, this can partially explain why no difference was observed in treatment with clozapine and other antipsychotics.

The study also had few methodological limitations: The sample size of the study was small and cohorts were unequally divided with only 43 out of the total patients treated with depot. Though, this is reflective of the real-world phenomenon. Additionally, CSRI only covered costs in the two economic domains for a total of 6 months. Schizophrenia is life-time illness; thus, this may not be enough in estimating the true costs. CSRI was also administered retrospectively and relied on the momentary recall, making the reported costs subjectable to recall error. However, this approach was necessary taking into consideration the strengths of the study design and primary objective which in our case was to analyze the cost of schizophrenia treatment with LAI versus oral antipsychotics from a broad, societal perspective.

Abbreviations: LAI- Long Acting Injections, RCT: Randomized Control Trial, CPA- Care Approach Program, CMHT-Community Mental Health Team, CSRI- Client Service Receipt Inventory, LAIR- Long Acting Injection Risperidone. Depot and Long acting injections used interchangeably.

REFERENCES

1. Mcgrath, J., Saha, S., Welham, J., Saadi, O. E., Maccauley, C., & Chant, D. (2004). A systematic review of the incidence of schizophrenia: The distribution of rates and the influence of sex, urbanicity, migrant status and methodology. BMC Medicine, 2(1).
2. Haycox, A. (2005). Pharmacoeconomics of long-acting risperidone: Results and validity of cost-effectiveness models. PharmacoEconomics,23(S1), 3-16. doi:10.2165/00019053-200523001-00002
3. Davies, L., & Drummond, M. (1990). The economic burden of schizophrenia. Psychiatric Bulletin, 14(9), 522-525. doi:10.1192/pb.14.9.522
4. Knapp M. Schizophrenia costs and treatment cost-effectiveness. Acta Psychiatr Scand 2000: 102 (Suppl. 407): 15±18
5. Olivares, J. M., Pinal, B., & Cinos, C. (2011). Comparison of long-acting antipsychotic injection and oral antipsychotics in schizophrenia. Neuropsychiatry,1(3), 275-289. doi:10.2217/npy.11.24
6. Peng, X., Ascher-Svanum, H., Faries, D., & Conley, R. (2011). Decline in the rate and cost of psychiatric hospitalization following initiation of depot antipsychotics in the treatment of schizophrenia. International Clinical Psychopharmacology,26. doi: 10.1097/01.yic.0000405809.66498.a6
7. Alphs, L., Schooler, N., & Lauriello, J. (2014). How study designs influence comparative effectiveness outcomes: The case of oral versus long-acting injectable antipsychotic treatments for schizophrenia. Schizophrenia Research, 156(2-3), 228-232. doi: 10.1016/j.schres.2014.04.024
8. Niaz, O. S., & Haddad, P. M. (2007). Thirty-five months experience of risperidone long-acting injection in a UK psychiatric service including a mirror-image analysis of in-patient care. Acta Psychiatrica Scandinavica,116(1), 36-46. doi:10.1111/j.1600-0447.2006.00980.x
9. Baser O, Xie L, Pesa J, et al. Healthcare utilization and costs of Veterans Health Administration patients with schizophrenia treated with paliperidone palmitate long-acting injection or oral atypical antipsychotics. J Med Econ. 2015;18(5):357–365. PubMed doi:10.3111/13696998.2014.1001514
10. Tiihonen, J., Haukka, J., Taylor, M., Haddad, P. M., Patel, M. X., & Korhonen, P. (2011). A Nationwide Cohort Study of Oral and Depot Antipsychotics After First

Hospitalization for Schizophrenia. American Journal of Psychiatry,168(6), 603-609. doi:10.1176/appi.ajp.2011.10081224

11. Drummond, M., Knapp, M., Burns, T., Miller, K., & Shadwell, P. (1998). Issues in the design of studies for the economic evaluation of new atypical antipsychotics: The ESTO study. The Journal of Mental Health Policy and Economics, 1(1), 15-22. doi:10.1002/(sici)1099-176x(199803)1:13.3.co;2-f
12. A comparison of two methods of collecting economic data in primary care. Anita Patel-Alison Rendu-Paul Moran-Morven Leese-Anthony Mann-Martin Knapp - Family Practice - 2005
13. Goossens, M. E., Mölken, M. P., Vlaeyen, J. W., & Linden, S. M. (2000). The cost diary. Journal of Clinical Epidemiology, 53(7), 688-695. doi:10.1016/s0895-4356(99)00177-8
14. Gaughran, F., Stahl, D., Ismail, K., Greenwood, K., Atakan, Z., Gardner-Sood, P., . . . Smith, S. (2017). Randomised control trial of the effectiveness of an integrated psychosocial health promotion intervention aimed at improving health and reducing substance use in established psychosis (IMPaCT). BMC Psychiatry,17(1). doi:10.1186/s12888-017-1571-0
15. Heslin, M., Patel, A., Stahl, D., Gardner-Sood, P., Mushore, M., Smith, S., Gaughran, F. (2017). Randomised controlled trial to improve health and reduce substance use in established psychosis (IMPaCT): Cost-effectiveness of integrated psychosocial health promotion. BMC Psychiatry,17(1). doi:10.1186/s12888-017-1570-1
16. Thorn, J. C., Coast, J., Cohen, D., Hollingworth, W., Knapp, M., Noble, S. M., . . . Hughes, D. (2013). Resource-Use Measurement Based on Patient Recall: Issues and Challenges for Economic Evaluation. Applied Health Economics and Health Policy,11(3), 155-161. doi:10.1007/s40258-013-0022-4
17. Ahmadkhaniha, H.-R., Bani-Hashem, S., & Ahmadzad-Asl, M. (2014). Depot Typical Antipsychotics versus Oral Atypical Antipsychotics in Relapse Rate Among Patients with Schizophrenia: A Five -Year Historical Cohort Study. Iranian Journal of Psychiatry and Behavioral Sciences, 8(1), 66–71.
18. . Rosenheck, R. A., Leslie, D. L., Sint, K. J., Lin, H., Li, Y., Mcevoy, J. P., . . . Stroup, T. S. (2016). Cost-Effectiveness of Long-Acting Injectable Paliperidone Palmitate Versus Haloperidol Decanoate in Maintenance Treatment of Schizophrenia. Psychiatric Services,67(10), 1124-1130. doi: 10.1176/appi.ps.201500447
19. Yatham, L. N., Fallu, A., & Binder, C. E. (2007). A 6-month randomized open-label comparison of continuation of oral atypical antipsychotic therapy or switch to long-acting injectable risperidone in patients with bipolar disorder. Acta Psychiatrica Scandinavica,116(S434), 50-56. doi:10.1111/j.1600-0447.2007. 01059.x
20. Conley, R., Kelly, D., Love, R., & Mcmahon, R. (2003). Rehospitalization Risk with Second-Generation and Depot Antipsychotics. Annals of Clinical Psychiatry,15(1), 23-31. doi:10.3109/10401230309085667
21. Mahadun, P. N., & Marshall, M. (2008). Insight and treatment attitude in schizophrenia: Comparison of patients on depot and atypical antipsychotics. Psychiatric Bulletin,32(02), 53-56. doi:10.1192/pb.bp.107.015875

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Conflict of Interest
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