Suicide in primary care in England:

2002-2011

National Confidential Inquiry into Suicide and Homicide by People with Mental Illness

March 2014

Contributors:

Louis Appleby [1]   Director

Nav Kapur [1]*   Head of Suicide Research

Jenny Shaw [1]   Head of Homicide Research

Kirsten Windfuhr [1]*   Senior Project Manager and Research Fellow

David While [1]*   Research Fellow

Roger Webb [1]   Senior Research Fellow, Psychiatric Epidemiology

Darren Ashcroft [2]   Professor of Pharmacoepidemiology

Evangelos Kontopantelis [3]   Senior Research Fellow

* Lead contributors

[1] National Confidential Inquiry into Suicide and Homicide by People with Mental Illness, Centre for Mental Health and Risk, University of Manchester, UK.

[2] Manchester Pharmacy School and NIHR Greater Manchester Primary Care Patient Safety Translational Research Centre, University of Manchester, UK

[3] Centre for Health Informatics, Institute of Population Health, University of Manchester, UK

Contact us:

National Confidential Inquiry into Suicide and Homicide by People with Mental Illness, Centre for Mental Health and Risk, Jean McFarlane Building, University of Manchester, Oxford Road, Manchester, M13 9PL

E-mail: nci@manchester.ac.uk

Visit us on our website:
www.bbmh.manchester.ac.uk/cmhr

Follow us on Twitter: @NCISH_UK

'Like' us on Facebook to get our latest research findings: Centre-for-Mental-Health-and-Risk

REPORT SUMMARY

Background to this study

Most people who die by suicide have seen their GP in the previous year. Although this may provide an opportunity for prevention, identifying patients who are at particular risk is difficult.

How does this study build on our previous work?

Our previous work has examined the frequency of primary care contact in mental health patients. This study extends our earlier work by:

- examining a representative sample of all primary care patients who died by suicide, not only those under mental health care,
- comparing these patients to other patients in primary care to identify markers of suicide risk, and
- examining data over a longer period (10 years).

Aims of the study

We wanted to examine aspects of primary healthcare prior to suicide to inform prevention. Specifically, we wanted to:

- compare the number and pattern of GP contacts in patients who died by suicide and in living controls,
- determine how frequently suicide was preceded by mental health diagnosis, prescription of psychotropic medication and referral to specialist mental health care,
- identify possible markers of suicide risk in primary care.

How we carried out the study

We conducted a case-control study, comparing people who died by suicide to living patients in primary care.

Information on all patients was obtained from a national patient database, the Clinical Practice Research Datalink (CPRD), for the years 2002-2011.

Deceased patients were identified through linkage between the CPRD and the Office for National Statistics (ONS) mortality dataset.

Up to 20 living patients were selected as controls for each patient who died by suicide. Deceased and living patients had similar characteristics, i.e. age, gender, and GP practice.

Key findings

- 37% of people who died by suicide had not seen their GP in the previous year. Risk was increased by 67% in non-attenders.
- Suicide risk also increased with increasing number of GP consultations, particularly in the 2 to 3 months prior to suicide. In those who attended more than 24 times, risk was increased 12-fold.
- 37% of those who died by suicide did not have a mental health diagnosis recorded on the database at any time.
- 52% had not been prescribed psychotropic drug treatment in the year before they died.
- Patients who died were more likely to be receiving psychotropic medication than living patients.
- Lithium was associated with a lower suicide risk than other groups of drugs; benzodiazepines were associated with a suicide risk equivalent to antidepressants.
- Being prescribed more than one type of drug was associated with an 11-fold increase in suicide risk.
- Only 8% of patients who died had been referred to specialist mental health services in the previous 12 months.

Key messages for services

1. In primary care patients who die by suicide, mental illness is frequently unrecognised.

2. Suicide risk is associated with frequent attendance, increasing attendance, and non-attendance.

3. Markers of risk in those attending include frequent consultation, multiple psychotropic drugs, and specific drug combinations such as benzodiazepines with antidepressants.

4. These markers could be the basis of a "flag" alert in primary care records, leading to further assessment.

5. The current Health Check in primary care should be amended to include mental health, as a step to identifying risk in non-attenders.

6. Suicide prevention in primary care non-attenders will have to rely on other agencies including the voluntary sector and internet based supports who may be better able to maintain contact with young people at risk.

Contact with primary care

- The majority of people are in contact with their general practitioner (GP) prior to suicide. Overall, 77% of individuals consult with their GP in the year before suicide; 45% consult in the preceding month.[1]

- Consultation patterns vary by patient characteristics. Older age, being female, and having a mental illness have been associated with more frequent GP consultations prior to suicide. Patients with a mental illness have also been shown to consult closer to the time of suicide.[1]

- In our study of primary care contact in mental health patients, 9 out of 10 patients had seen their GP at least once in the year before suicide.[2]

Identification and pharmacological treatment of mental illness

- Depression is the most common mental illness with which patients present to their GP.[3]

- Since the 1980s studies have reported a lack of identification of depression, with GPs recognising depression in approximately one third of patients.[4]

- However, rates of treatment with antidepressants have increased markedly between 2000 and 2009 although wide variation in pharmacological treatment persists.[5]

- Antidepressants are prescribed mainly for depression, although the use of antidepressants for the treatment of other conditions (e.g. pain management), may also have contributed to this increase.[6]

Referral to specialist mental health care

- Referral patterns are influenced by patient characteristics (e.g. being male, younger age, chronic depression), clinical characteristics (e.g. treatment failure, perceived need for psychotherapy, patients with psychosis) and GP practice characteristics (e.g. degree of urbanisation, type of GP practice, availability of specialist and on-site services such as mental health practitioners).[7-9]

KEY FINDINGS OF PREVIOUS NCISH PRIMARY CARE STUDIES [2, 10]

91% of patients who died by suicide had seen their GP in the last 12 months.

Patients saw their GP on average seven times in the year before they died.

47% of patients saw their GP in the month before they died.

26% of GPs were concerned about their patient's safety.

16% of GPs felt the suicide could have been prevented.

Key themes in interviews with GPs were:
- lack of access to mental health services, and
- problems of working within changing NHS service structures.

- In a previous study we interviewed GPs about the suicide of their patients: themes that emerged were lack of access to mental health services and problems of working within changing NHS service structures.[10]

Study aim

- To examine contacts with primary care in people who died by suicide, and the clinical care they received in the previous 12 months.

Study objectives

- To compare the number and pattern of GP contacts, in patients who died by suicide and living controls.

- To determine how frequently suicide was preceded by mental health diagnosis, prescription of psychotropic medication and referral to specialist mental health care.

- To identify possible markers of suicide risk in primary care.

METHODS

Data collection

- The Clinical Practice Research Datalink (CPRD) was linked with the Office for National Statistics (ONS) mortality dataset in order to identify primary care patients aged 16 or older who died by suicide between 2002 and 2011.

- Suicides were defined as deaths that received a suicide or open verdict at coroner's inquest, as is conventional in research and national statistics.

- Patients who died were matched on their date of death with patients who were alive on that date. Matching was by age, gender, and GP practice.

Consultations

- Information was extracted from the CPRD on the number and timing of consultations.

- The period of time studied was 12 months prior to suicide for most items.

- Only face-to-face consultations with the GP in the surgery were included.

- Multiple contacts on one day were counted as one consultation, giving a conservative estimate of consulting frequency and patterns.

Mental health

- Information was extracted on:

    - mental health diagnosis,

    - psychotropic medication i.e. drugs prescribed for mental illness, individually and by drug group (e.g. antidepressants),

    - multiple drug prescribing, i.e. drugs from at least 2 different drug groups during the 12 months prior to suicide. Multiple drugs may have been prescribed concurrently or sequentially,

    - referrals to specialist mental health services.

METHODS SUMMARY

The Clinical Practice Research Datalink (CPRD) is a primary care database holding 5 million electronic patient records (8% of the UK population).

CPRD data are linked with the Office for National Statistics (ONS) mortality data for England only.

This dataset was used to identify primary care patients who died by suicide between 2002 and 2011 and who were 16 years or older.

We examined:
- frequency and patterns of GP consultations,
- diagnosis of mental illness,
- prescription of psychotropic drugs, and
- referral to specialist mental health services.

The data for patients who died were compared to living patients who were similar in age, gender and GP practice attended.

Analysis (see also Appendix A)

- We wanted to determine the strength of the relationship between suicide risk and consultation, diagnosis and medication. We did this by calculating an odds ratio (OR).

- An OR of greater than 1 indicates an increased risk. The OR is presented with a 95% confidence interval as a measure of its accuracy.

- As the OR is a measure of risk, it is referred to as 'risk' throughout the report.

FINDINGS

Patient characteristics

- **2,384** patients who died by suicide were matched with **46,899** living patients.

- Of the patients who died, 76% were male, and the median age was 45 (figure 1).

- The number of these patients who had seen their GP, had a mental health diagnosis, received drug treatment, or were referred to specialist mental health services is shown in figure 2.

Primary care practices

- There were 335 general practices in the 375 practices in England linked to ONS mortality data in which at least one patient had died by suicide between 2002 and 2011.

- The median number of suicide deaths per practice in the 10 year period was 6.

SUMMARY FINDINGS: PATIENT AND GP PRACTICE CHARACTERISTICS

2,384 patients died by suicide (England, 2002-2011).

76% were male; the median age was 45.

There were 335 (of 375) general practices in which at least one patient died.

There was a median of 6 deaths per practice, in the 10 year period.

Figure 2. Patients who died by suicide: GP consultation, mental health diagnosis, drug treatment and specialist mental health referral

2,384 patients who died by suicide

Face-to-face GP consultation within 12 months of suicide

number= 1,504 (63%)

Mental health diagnosis (any time)

number= 1,497 (63%)

Psychotropic drug treatment within 12 months of suicide

number= 1,148 (48%)

Mental health referral within 12 months of suicide

number= 188 (8%)

Clinical time line

Figure 1. Patients who died by suicide by age group and gender

Age groups
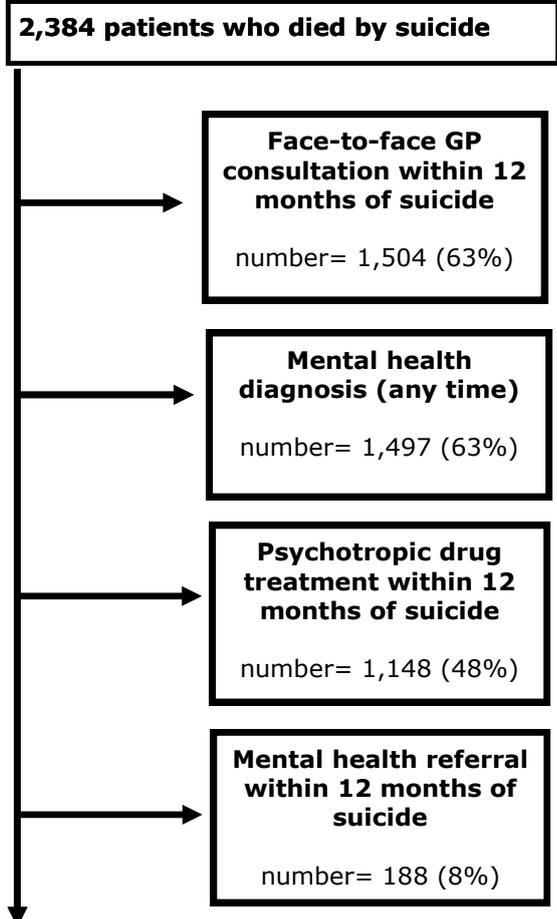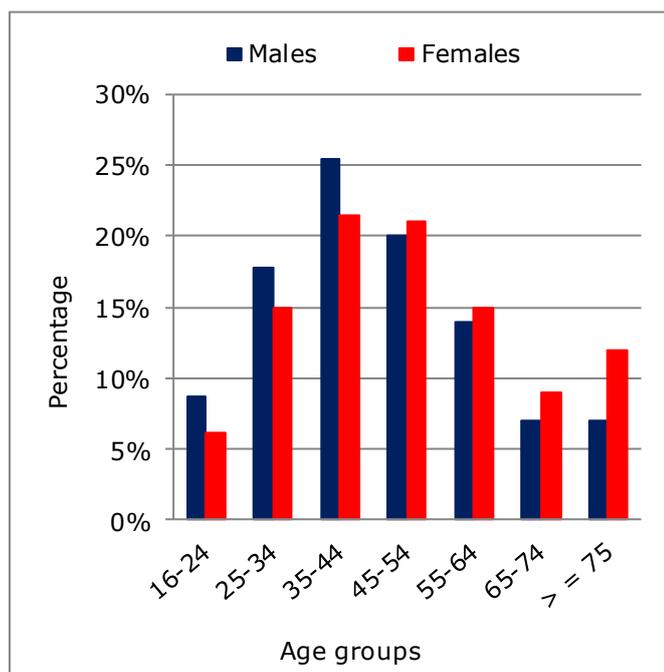
Face-to-face consultations with the GP

- Of the 2,384 patients who died 1,504 (63%) consulted their GP in the previous 12 months (figure 3).

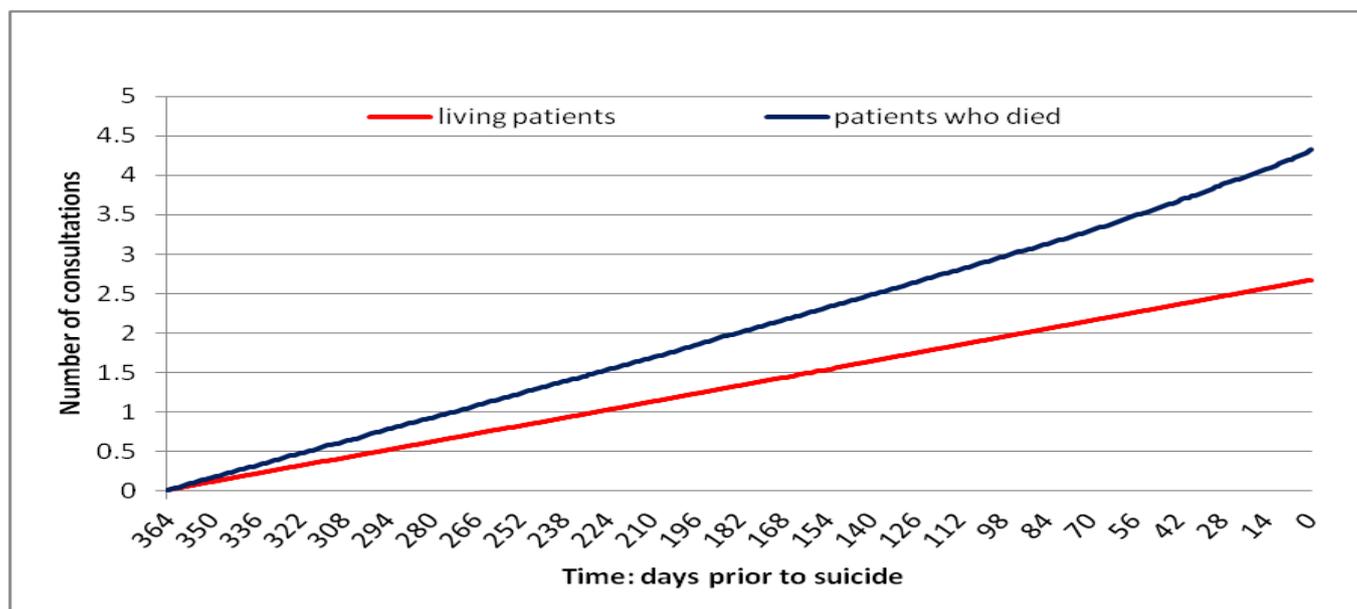- Patients who died consulted their GP more often in the 12 months prior to suicide compared to living patients in the same year. Figure 4 shows the number of consultations for patients who died and living patients during that year.

- Those who died consulted more frequently throughout the previous year. The increasing rate of consultation became more marked 2 to 3 months before suicide.

- For patients who consulted their GP in the 12 months before they died, the number of consultations ranged from 1 to 71, and the median was 5.

- In frequent attenders who died, the male preponderance was less marked. 45 (2%) had more than 24 consultations during the 12 months and 28 (62%) were male. 167 (7%) consulted 15 or more times and 93 (56%) were male.

- In 880 (37%) there were no consultations in the year before death (figure 3).

Figure 3. Number of consultations in the 12 months prior to suicide
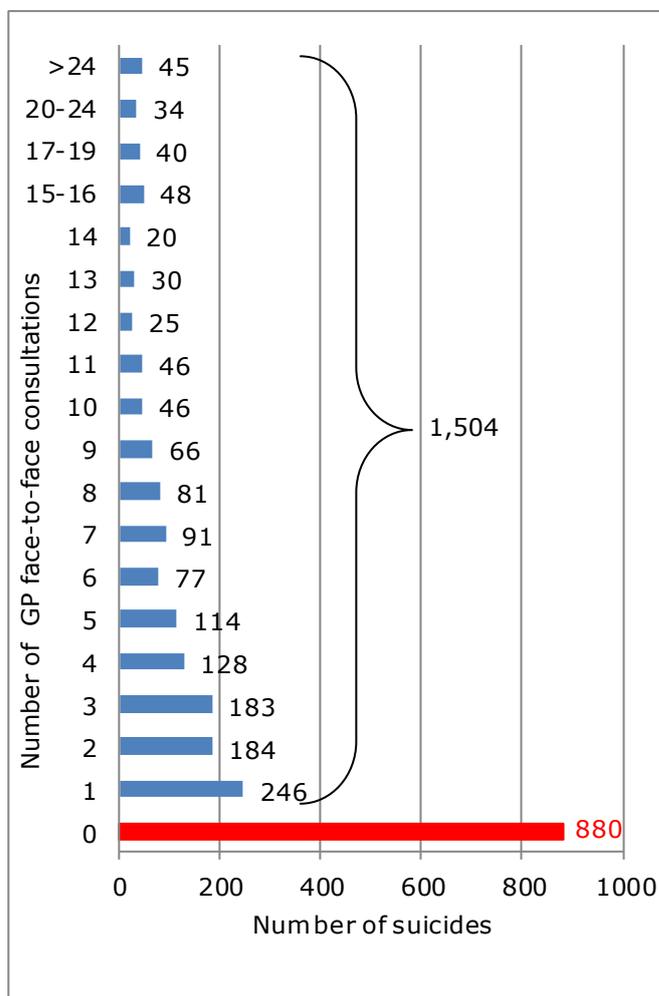
Figure 4. Number of consultations in the 12 months (0-364 days) prior to suicide and in living controls

Face-to-face consultations with the GP

- Characteristics of patients who did and did not consult in the 12 months prior to suicide are shown in Table 1 and Figure 5.

- Non-attenders were more likely to be male and in both genders were younger.

- Non-attendance was associated with lower rates of mental health diagnosis.

Table 1. Characteristics of patients who did and did not consult with their GP prior to suicide

	No GP consultations		At least one GP consultation	
	Number=880		Number=1,504	
	Number	%	Number	%
Male	718	82%	1,086	72%
Mental health diagnosis recorded at any time	411	47%	1,086	72%
Psychotropic drugs prescribed within 12 months of suicide	85	10%	1,063	71%

Note. Differences between all groups significant at $p<0.01$.

Figure 5. 5-year age bands for (a) male and (b) female patients who did and did not consult with their GP in the 12 months prior to suicide

(a)

(b)
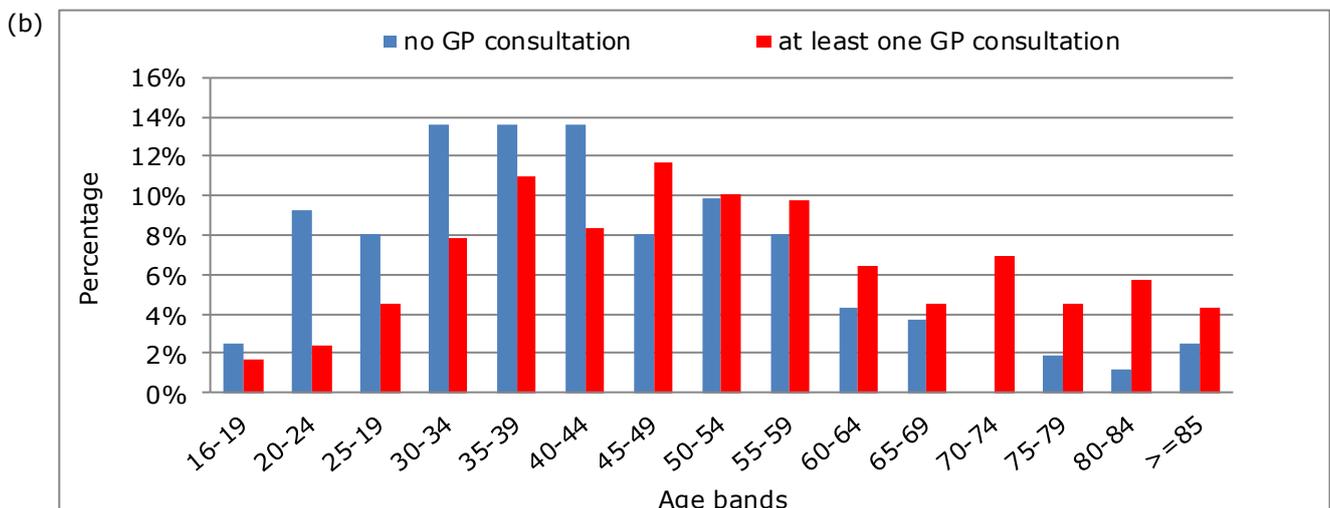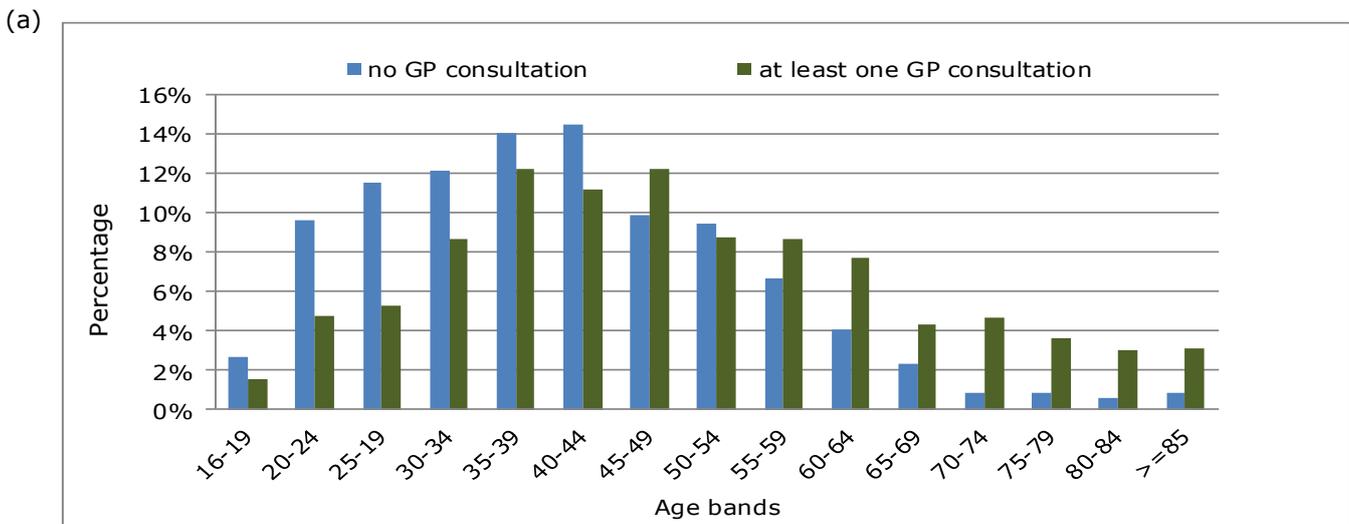
Number of GP consultations and risk of suicide

- The risk of suicide increased with increasing number of GP consultations. Risk (odds ratios) and 95% confidence intervals are shown in Figure 6.

- The greatest risk of suicide was associated with more than 24 consultations – risk of suicide was 12.3 times the risk of one consultation.

- Figure 6 also suggests a large increase in risk for patients who consulted 15 to 16 times - their risk was 7.8 times higher than those with one consultation.

- Increased risk of suicide was also associated with no GP consultations. Non-attendance in the previous 12 months was 1.67 times the risk of one consultation, i.e. a 67% increased risk of suicide.

SUMMARY FINDINGS: GP CONSULTATIONS

In the year prior to suicide:
- 1,504 (63%) consulted between 1 and more than 24 times
- 880 (37%) did not consult.

Patients who consulted their GP in the 12 months before they died consulted more frequently than patients who did not die, particularly in the 2 to 3 months prior to their death; a median of 5 consultations over the year.

Patients who did not consult with their GP:
- were more often male
- were younger (in both genders)
- had lower rates of mental health diagnosis.

Risk was:
- 12.3 times greater for patients who consulted more than 24 times
- 7.8 times higher for patients who consulted 15 to 16 times, and
- 1.67 times higher for patients who did not consult with their GP.

Figure 6. Suicide risk (odds ratios) in relation to the number of face-to-face GP consultations in the 12 months prior to suicide
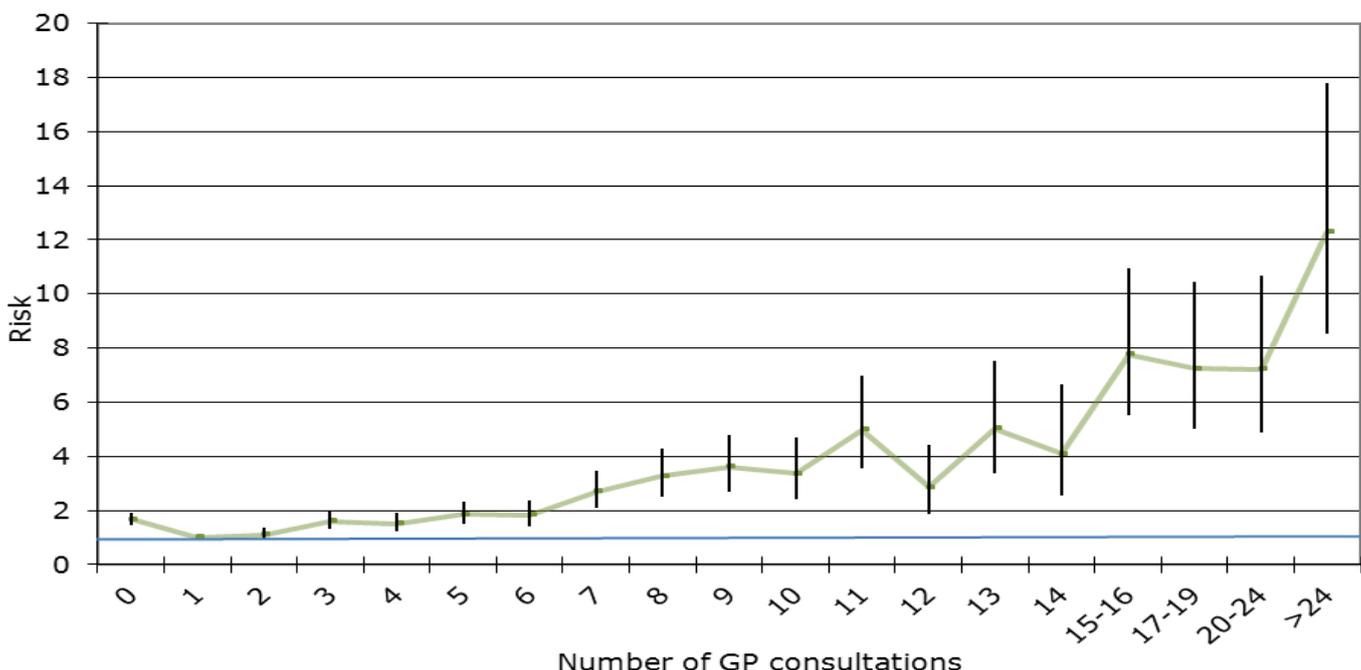
Mental health diagnosis and risk of suicide

- 1,497 (63%) patients who died by suicide had a mental health diagnosis recorded at any time. This compares to 13,263 (28%) living patients.

- In 1,057 of these (71%) the diagnosis was depression.

- 619 (26%) had a mental health diagnosis recorded in the 12 months before suicide.

- Patients who died were 4.7 times more likely to have a mental health diagnosis.

- 887 (37%) patients who died had no mental health diagnosis recorded in the CPRD at any time.

- Of this group, 731 (82%) were male, and the largest group were aged 35-44 (194; 22%).

Prescribed drugs

- 1,148 (48%) patients had been prescribed a psychotropic drug in the 12 months before suicide. 1,236 (52%) had no drug treatment.

- Of those who did not receive any drug treatment in the previous 12 months, 1,021 (83%) were male and the largest group were aged 35-44 (312; 25%).

- Risk associated with groups of psychotropic drugs is shown in Table 2.

- Patients who died were 5 times more likely to have been prescribed a psychotropic drug, 5 times more likely to have been prescribed an antipsychotic and 7 times more likely to have been prescribed an antidepressant.

- The highest risks were associated with atypical and depot antipsychotics and "other" antidepressants - these drugs may be markers for treatment difficulties, poor adherence with treatment, or the severity of the underlying mental illness.

Table 2. The number, percentage and risk (odds ratios) for 10 groups of psychotropic drugs, for living patients and patients who died by suicide

All psychotropic drug groups	Living patients (N=46,899)	Patients who died (N=2,384)	Risk (OR; 95% CI)
Typical antipsychotics	830 (2%)	135 (6%)	3.4 (2.8-4.1)
Atypical antipsychotics	326 (0.7%)	214 (9%)	14.7 (12.2-17.6)
Depot antipsychotics	18 (0.04%)	13 (0.5%)	14.2 (6.9-29.0)
Lithium and other mood stabilisers	547 (1%)	100 (4%)	3.7 (3.0-4.6)
SSRI antidepressants	2,620 (6%)	604 (25%)	6.0 (5.4-6.7)
Tricyclic antidepressants	1,625 (3%)	291 (12%)	4.1 (3.6-4.7)
Other antidepressants	569 (1%)	280 (12%)	11.3 (9.7-13.1)
Benzodiazepines	1,621 (3%)	450 (19%)	7.0 (6.2-7.9)
Other anxiolytics and hypnotics	858 (2%)	322 (14%)	8.9 (7.7-10.3)
Opioid analgesics	2,787 (6%)	252 (11%)	1.9 (1.7-2.2)

Note. All variables were significantly different between groups, $p < 0.01$.

- The risk associated with lithium and other mood stabilisers was lower than with other psychotropic drugs.

- The risk associated with benzodiazepines - drugs intended to treat "minor" or transient (e.g. for patients in crisis) anxiety or insomnia - was equivalent to the risk with most antidepressants.

- The risk associated with opioid drugs was lower than with psychotropic drugs but in the case of methadone, a 6-fold increase was found.

- See Appendix B for the risk associated with the 5 most common antipsychotic, antidepressant and benzodiazepine drugs.

Multiple drug prescriptions

- 736 (31%) patients who died had been prescribed drugs from two or more drug groups in the previous 12 months ranging from two groups (305, 13%) to five or more groups (94, 4%).

- Suicide risk was increased 11-fold in these patients.

Figure 7. Suicide risk (odds ratios) associated with multiple psychotropic drugs, compared to none, in the 12 months prior to suicide

---
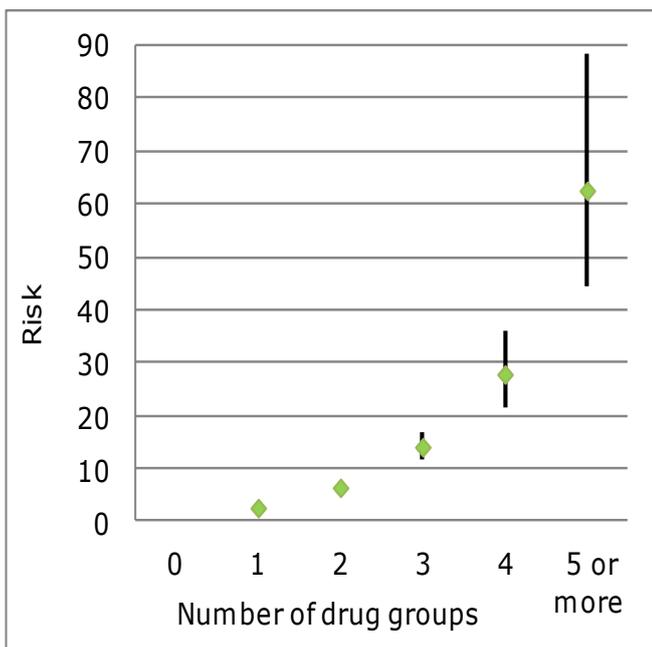
SUMMARY FINDINGS:
DIAGNOSIS, DRUGS AND REFERRAL

1,497 (63%) patients who died by suicide had a mental health diagnosis at any time prior to death, compared to 13,263 (28%) of living patients.

In 1,057 (71%) of these patients, the diagnosis was depression.

1,148 (48%) patients had been prescribed a psychotropic drug in the 12 months before suicide.

Patients who died were:
- 5 times were likely to have been prescribed a psychotropic drug

- 5 times more likely to have been prescribed an antipsychotic

- 7 times more likely to have been prescribed an antidepressant

There was an increased risk with increasing number of drugs prescribed.

188 (8%) patients who died were referred to mental health services in the 12 months prior to suicide.

- There was an increased risk with increasing number of drugs prescribed (between 1 and 5 or more). Risk (odds ratios) and 95% confidence intervals are shown in Figure 7.

- The combination of at least one benzodiazepine and one antidepressant was associated with an 18-fold increase in risk.

Referral to specialist mental health services

- 188 (8%) patients who died were referred to mental health services in the previous 12 months.

- This did not include patients who were already under specialist mental health care. We have shown that 25% of people who die by suicide have been in recent contact with specialist mental health services.[11]

- 134 (71%) patients who were referred were male. 64 (34%) patients were aged 30-44.

- 580 (24%) had been referred to specialist mental health services at some time.

DISCUSSION

- 37% of people who died by suicide had not seen their GP in the previous year and risk was 67% higher in this group. Non-attenders were more likely to be male and in both genders were younger than those who consulted with their GP.

- Suicide prevention in people who do not attend in primary care is clearly difficult. GPs cannot be expected to assess large numbers of people who currently do not attend. For the youngest age groups dedicated services such as in the voluntary sector or internet based supports may offer a more realistic approach to prevention. Future work might examine what other services (e.g. drug and alcohol services, NHS walk-in centres, A&E, educational facilities) non-attenders access in order to identify other potential avenues for prevention.

- However, the current Health Check could offer a way of identifying suicide risk in people aged over 40 and we believe it should be amended to include mental health. Simple screening for depression is unproven but targeted case-finding in men with other risk factors may be a more clinically appropriate approach.

Limitations

CPRD data are linked with the Office for National Statistics for English GP practices only; not all GP practices in England are included.

Multiple prescriptions of drugs indicated either concurrent prescription of drugs (polypharmacy) **or** consecutive prescription of multiple drugs. It was not possible to distinguish between these in this study.

The CPRD includes only primary care drug prescribing and we do not know what medications people were prescribed by other health services (e.g. specialist mental health services).

There was no coding of psychological therapy or other non-drug treatments.

We could not determine which CPRD patients were already under the care of specialist mental healthcare services, or the date on which that care had commenced.

Research Implications

Our study shows the value of the CPRD database in investigating factors associated with suicide in patients in primary care.

Linking the CPRD with Hospital Episode Statistics (HES) and other datasets could provide data on the full patient pathway from primary into specialist mental health care.

- Suicide risk also increased significantly with increasing number of GP consultations. Frequent and increasing attendance can be markers of suicide risk in primary care.

- Under-recognition of mental illness was common; 37% of those who died did not have a recorded mental health diagnosis, 52% were not receiving drug treatment and in only 8% was there a new referral to mental health services.

- However, we cannot say that these patients were untreated as we did not have access to information on non-drug treatments.

- All psychotropic drugs were markers of suicide risk - in other words, people who are prescribed these drugs should be seen as at risk. Higher risks associated with certain drugs (e.g. those given as depots) are likely to reflect greater illness severity rather than a causal role for the drugs.

- Risk associated with lithium was lower than for other drugs even though it is prescribed for a high risk condition, bipolar disorder. This finding adds to the evidence that lithium can reduce the risk of suicide in patients with this diagnosis. Closer monitoring for patients prescribed lithium may also have contributed to lower suicide risk.

- Receiving multiple psychotropic drugs was associated with higher suicide risk and could be a marker of risk in primary care.

- The risk associated with benzodiazepines was as high as for antidepressants. Benzodiazepines are intended for the treatment of minor or transient anxiety or insomnia. Our findings show that the people who receive them are in fact at high suicide risk.

- The use of benzodiazepines in these patients may be clinically inappropriate.

- An automated system of flagging patients who are frequent attenders could lead to further assessment for patients who attend 15 or more times in a year. Alerts of this kind are used in other areas of primary care.

- A similar flagging system could alert GPs to suicide risk in patients receiving two or more psychotropic drugs, particularly combinations such as benzodiazepines and antidepressants.

Key messages for services

1. In primary care patients who die by suicide, mental illness is frequently unrecognised.

2. Suicide risk is associated with frequent attendance, increasing attendance, and non-attendance.

3. Markers of risk in those attending include frequent consultation, multiple psychotropic drugs, and specific drug combinations such as benzodiazepines with antidepressants.

4. These markers could be the basis of a "flag" alert in primary care records, leading to further assessment.

5. The current Health Check in primary care should be amended to include mental health, as a step to identifying risk in non-attenders.

6. Suicide prevention in primary care non-attenders will have to rely on other agencies including the voluntary sector and internet based supports who may be better able to maintain contact with young people at risk.

REFERENCES

1. Luoma, J B, Martin, C E, Pearson, J L (2002) Contact with mental health and primary care providers before suicide: A review of the evidence. *American Journal of Psychiatry*, **159**, 909-16.

2. Pearson, A, Saini, P, DaCruz, D, Miles, C, While, D, Swinson, N, Williams, A, Shaw, J, Appleby, L, Kapur, N. (2009) Primary care contact prior to suicide in individuals with mental illness. *British Journal of General Practice*, **59**, 825-832.

3. King, M, Nazareth, I, Levy, G, Walker, C, Morris, R, Weich, S, Angel, Bellón-Saameño, J, Moreno, B, Švab, I, Rota, D, Rifel, J, Maaroos, H, Aluoja, A, Kalda, R, Nelleman, J, Geerlings, M, Xavier, M, de Almeida, M, Correa, B, Torres-Gonzalex, F. (2008) Prevalence of common mental disorders in general practice attendees across Europe. *British Journal of Psychiatry*, **192**, 362-367.

4. Mitchell, A, Vae, A, Rao, S. (2009) Clinical diagnosis of depression in primary care: a meta-analysis. *Lancet,* **374**, 609-619.

5. Menchetti, M, Casini, F, Versari, M, Bortolotti, B, Nespeca, C, Berardi, D. (2011) Pharmacological treatment of depression in primary care. An updated literature review (2000-2009). *Clinical Neuropschiatry*, **8(4)**, 234-242.

6. Gardarsdottir H, Heerdink R, van Dijk L, Egberts A. (2007) Indications for antidepressant drug prescribing in general practice in the Netherlands. *Journal of Affective Disorders*, **98**, 109-15.

7. Verhaak, PFM. (1993) Analysis of referrals of mental health problems by general practitioners. *British Journal of General Practice*, **43**, 203-208.

8. Harkness, EF, Bower PJ. (2009) On-site mental health workers delivering psychological therapy and psychosocial interventions to patients in primary care: effects on the professional practice of primary care providers. *Cochrane Database of Systematic Reviews*, **1**. Art. No.: CD000532.

9. Piek, E, van der Meer, K, Penninx, B, Verhaak, P, Noeln, W. (2011) Referral of patients with depression to mental health care by Dutch general practitioners: an observational study. *BMC Family Practice*, **12**,41.

10. Saini, P, Windfuhr, K, Pearson, A, DaCruz, D, Miles, C, Cordingley, L, While, D, Swinson, N, Williams, A, Shaw, J, Appleby, L, Kapur, N. (2010) Suicide prevention in primary care: General practitioners' views on service availability. *BMC Research Notes*, **3**, 246.

11. Appleby, L, Kapur, N, Shaw, J, Hunt, IM, While D, Flynn, S, Windfuhr, K, Williams, A. (2013) Annual Report: England, Northern Ireland, Scotland and Wales. Available at: http://www.bbmh.manchester.ac.uk/cmhr/research/centreforsuicideprevention/nci/reports/annual_report_2013.pdf

Appendix A: Methods

Statistical analysis

- The matching of up to 20 controls for each patient who died by suicide provided enough statistical power to calculate the risk associated with suicide.

- CPRD data were linked with mortality data from the Office for National Statistics (ONS) (for England) to identify all suicide (ICD-10: X60-84) & undetermined deaths (Y10-34) (excluding Y 33.9) and Y87.2.

- Descriptive data are presented using numbers and percentages.

- Odds ratios (OR) were calculated as a measure of the relative risk associated with different factors. ORs are presented with 95% confidence intervals (CIs) to show the accuracy of the estimate, and a p-value set at <0.01 significance.

- An odds ratio (OR) is used to measure the association between an outcome (i.e. suicide) and an exposure (e.g. medication) in a case-control study.

- All statistical analyses were carried out using STATA software release 11.0.

Ethics

- Access to the CPRD was approved by the Independent Scientific Advisory Committee at the CPRD (ISAC reference number: 12_031).

- Patient consent is not required to access the CPRD as the dataset holds anonymised patient records.

Appendix B: Individual drugs and suicide risk

Antipsychotics	Living patients (N=46,899)	Patients who died (2,384)	Risk (OR); 95% CI
prochlorperazine	621 (1%)	43 (2%)	1.4 (1.0-1.9)
olanzapine	145 (0.3%)	112 (5%)	16.1 (12.5-20.8)
risperidone	105 (0.2%)	67 (3%)	13.4 (9.8-18.4)
quetiapine	60 (0.1%)	42 (2%)	14.4 (9.6-21.5)
chlorpromazine	64 (0.1%)	32 (1%)	10.0 (6.5-15.3)

Antidepressants	Living patients (N=46,899)	Patients who died (2,384)	Risk (OR); 95% CI
citalopram	1,132 (2%)	267 (11%)	5.3 (4.6-6.1)
amitriptyline	1,054 (2%)	141 (6%)	2.8 (2.3-3.4)
fluoxetine	874 (2%)	189 (8%)	4.7 (4.0-5.5)
venlafaxine	288 (0.6%)	145 (6%)	10.8 (8.8-13.3)
paroxetine	308 (0.7%)	93 (4%)	6.3 (5.0-8.0)

Benzodiazpines	Living patients (N=46,899)	Patients who died (2,384)	Risk (OR); 95% CI
diazepam	965 (2%)	266 (11%)	6.2 (5.3-7.2)
temazepam	466 (1%)	137 (6%)	6.5 (5.3-7.9)
nitrazepam	105 (0.2%)	35 (2%)	6.9 (4.6-10.2)
lorazepam	84 (0.2%)	51 (2%)	12.7 (8.9-18.1)
chlordiazepoxide	74 (0.2%)	42 (2%)	11.8 (8.0-17.3)

Appendix C: Membership of NCISH Independent Advisory Group

Ben Thomas (Chair), Director of Mental Health and Learning Disability Nursing, Department of Health, England

Richard Bunn, Consultant Forensic Psychiatrist, Belfast Trust, Shannon Clinic, Northern Ireland

Jeremy Butler (lay representative), Non-executive Director at the National Patient Safety Agency and the Berkshire Healthcare NHS Trust, retired pilot and General Manager for British Airways, advisor to Boeing on aircraft accidents

Jonathan Campion, Visiting Professor of Population Mental Health, University College London; Director of Population Mental Health, UCL Partners; Director for Public Mental Health and Consultant Psychiatrist, South London and Maudsley NHS Foundation Trust

Moira Connolly, Principal Medical Officer for Mental Health, Scottish Government, Consultant Psychiatrist

Mick Dennis, Professor of Psychiatry for Older People & Honorary Consultant Psychiatrist, Swansea University and Abertawe Bro Morgannwg University Health Board, Swansea

Michael Holland, Consultant Psychiatrist and Associate Medical Director for Revalidation and Quality at South London and Maudsley NHS Foundation Trust

Helen Laing, National Clinical Audit Lead, HQIP

Ian McMaster, Medical Advisor, Department of Social Services and Public Safety (DHSSPS), Northern Ireland

Jenny Mooney, Business Manager, Clinical Outcome Review Programme, HQIP

John Morgan, Consultant General Adult Psychiatrist

Sian Rees, Interim Director, University of Oxford Health Experiences Institute, Department of Primary Care Health Sciences

Geraldine Strathdee, National Clinical Director for Mental Health, NHS England, Consultant Psychiatrist

Sarah Watkins, Senior Medical Officer, Department for Health and Social Services and Children (DHSSC) and Department of Public Health and Health Professions (DPHHP), Welsh Government