Changes in pathology ordering by general practitioners in Australia, 1998 to 2001

GP Statistics and Classification Unit

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The General Practice Statistics and Classification Unit is a collaborating unit of the Australian Institute of Health and Welfare and the University of Sydney, situated within the Family Medicine Research Centre at Westmead Hospital. It fulfils the obligation of the Australian Institute of Health and Welfare to collect statistics regarding general practitioners, their patients and their patients' care.

Recent related publications:

General Practice Statistics and Classification Unit 2000 SAND abstracts from the BEACH program. Sydney: AIHW/University of Sydney. Viewed 22 December 2000. http://www.fmrc.org.au/beach.htm

Britt H, Miller GC & Valenti L 2001. 'It's different in the bush': a comparison of general practice activity in metropolitan and rural areas of Australia 1998–2000. AIHW Cat. No. GEP 6. Canberra: Australian Institute of Health and Welfare (General Practice Series No. 6).

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GENERAL PRACTICE SERIES
Number 13

BEACH

Bettering the Evaluation and Care of Health

Changes in pathology ordering by general practitioners in Australia 1998–2001

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November 2003

A joint report by the University of Sydney and the Australian Institute of Health and Welfare
AIHW Cat. No. GEP 13

This is the thirteenth publication of the General Practice Series, from the General Practice Statistics and Classification Unit, a collaborating unit of The University of Sydney and the Australian Institute of Health and Welfare. A complete list of the Institute's publications is available from the Publications Unit, Australian Institute of Health and Welfare, GPO Box 570, Canberra ACT 2601, or via the Institute's web site at http://www.aihw.gov.au.

ISBN 1 74024 310 2

ISSN 1442 3022

Suggested citation

Britt H, Knox S & Miller GC 2003. Changes in pathology ordering by GPs in Australia, 1998–2001. AIHW Cat. No. GEP 13. Canberra: Australian Institute of Health and Welfare (General Practice Series No. 13)

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Published by the Australian Institute of Health and Welfare

Printed by Elect Printing

Foreword

Pathology is the scientific study of disease and as such underpins most of medicine. Pathology tests are now a common part of modern medical practice and are used to screen for, confirm, exclude and monitor disease.

Over many years in Australia pathology test utilisation has grown at a rate far in excess of other medical activity. Tests are recorded in the Medicare database, allowing us to count the use of pathology service for all Australian citizens. In turn this allows us to investigate relationships of pathology testing with age, sex, state, place of residence, circumstances of collection/hospital status etc. Medicare data can also provide us with some information about the characteristics of the medical practitioners requesting pathology tests.

Unfortunately the Medicare data are deficient in two vital aspects. In most cases the Medicare item number used for claiming does not specifically identify individual pathology tests, a single item often covering a number of like tests. Secondly there is no documentation of the reason for the pathology test request. Analysis of the highly significant growth that has occurred in Medicare pathology item claims therefore is confounded by not knowing which specific tests are being performed more often and why they are being requested. Much speculation has occurred around the 'Drivers of Growth' for pathology test usage but there is little evidence that this has improved our understanding of what is a complex and confusing phenomenon.

Both the increased frequency of initiating an episode of pathology testing and the increased number of tests per episode are continuing to be a matter of great concern to Government and the providers of pathology testing services. Finding out more about the 'Drivers of Growth' is therefore vital for the future of this essential part of modern medicine.

This report from the BEACH program, on growth in pathology test requests by general practitioners, helps answer some of the unanswered questions. An earlier study from the BEACH program, *Pathology Ordering by General Practitioners in Australia 1998*, described the relationship between pathology test ordering and the characteristics of the GPs and patients. As well as the basic patient demographic associations (age, sex, place of residence etc) already demonstrated through analysis of the Medicare database, for the first time pathology test use was linked to clinical information (the problem being managed). As would have been predicted there was marked variation in individual and total test use depending on the patient's condition but the relationships were often unanticipated. The variation in requesting rate by GPs was strongly influenced by GP demographic factors (age, sex, participation rate, area of practice, practice size etc). Much of this information had never been previously described and was therefore of great value. However the data represented a cross-sectional 'snapshot in time' of GP pathology test ordering over a nine month period.

This study concentrates on changes in pathology ordering by GPs over a 3 year period, from 1998 to 2001. It has identified many factors associated with this growth in pathology test utilisation. The evidence indicates the increase is not a random unpredictable process but is being driven by patient and GP factors and by changes in medical practice in Australian health care delivery.

This study will better inform the debate on pathology test utilisation. It will also enable accurate predictions of growth of pathology test use and development of appropriate interventions to change growth rates.

Dr Michael Harrison, FRCPA

Chair

Quality Use of Pathology Committee

Department of Health and Ageing

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Acknowledgments

This project was undertaken as a commissioned and funded by the Commonwealth Department of Health and Ageing as an independent study.

The General Practice Statistics and Classification Unit wishes to thank the 3,030 general practitioners who participated in Bettering the Evaluation and Care of Health (BEACH) between April 1998 and March 2001. This report would not have been possible without their valued cooperation and effort in providing the data.

We also thank the following organisations for their financial support and their contribution to the ongoing development of the BEACH program during part or all of the first three years of the program (April 1998–March 2001) on which this report is based.

- the Commonwealth Department of Health and Ageing
- the Commonwealth Department of Veterans' Affairs
- the National Occupational Health and Safety Commission
- AstraZeneca (Australia)
- Aventis Pharma Pty Ltd
- Roche Products Pty Ltd
- Janssen-Cilag Pty Ltd.

We acknowledge the support of the Royal Australian College of General Practitioners, the Australian Medical Association, the Australian Divisions of General Practice, the Australian College of Rural and Remote Medicine and the Consumers Health Forum, and the contribution of their representatives to the BEACH Advisory Board.

In the preparation of this report we are grateful for the support of the other current members of the Family Medicine Research Centre, particularly Joan Henderson for her editing assistance. We also recognise the contribution of past members of the BEACH team to the collection of the BEACH data and its preparation for analysis.

The cooperation of Carolynn Fredericks of the General Practice Branch of the Commonwealth Department of Health and Ageing in regularly supplying general practitioner random samples and national Health Insurance Commission data for the BEACH program over the period of this study is also appreciated.

At the Australian Institute of Health and Welfare, we wish to thank Jenny Hargreaves for editing the report, and Ainsley Morrissey for coordinating the printing and publication process.

Ethics approval for the BEACH study was obtained from the Human Ethics Committee of the University of Sydney and the Health Ethics Committee of the Australian Institute of Health and Welfare.

Summary

Background

There has been an increase in the number of pathology tests claimed by pathologists per episode in recent years. The extent to which this reflects a change in the ordering behaviour of general practitioners (GPs) and the extent to which any such change relates to changes in the characteristics of practicing GPs and/or other factors has been questioned.

Aims

To describe changes in the pathology-ordering behaviour of GPs and to investigate the extent to which these changes are related to changes in the characteristics of the GP population, the morbidity under management, other management behaviour and the length of consultation.

Method

A secondary analysis of data from the BEACH (Bettering the Evaluation and Care of Health) program, a continuous study of general practice activity from the three years April 1998–March 2001.

A random sample of GPs who claimed at least 375 general practice Medicare items of service in the previous 3 months is regularly drawn from the Health Insurance Commission data by the General Practice Branch of the Department of Health and Ageing. GPs are approached by letter and followed up by telephone recruitment. Each participating GP completes details about 100 consecutive patient encounters on structured paper encounter forms and provides information about themselves and their practice. Data elements include details of the encounter (including Medicare item number where applicable), patient characteristics, morbidity managed, and for each problem the pathology tests (up to five per encounters) and imaging ordered, the medications prescribed, advised or supplied, clinical treatments and therapeutic procedures.

Each GP also provides information about themselves and their practice, and these data form the basis of the analysis of change in GP characteristics over time.

The samples used for the current study were April 1998–March 1999 (98,400 encounter records from 984 GPs), 1999–2000 (104,700 encounters from 1,047 GPs) and 2000–01 (99,900 encounters from 999 GPs).

Statistical methods

GP weights were calculated by standardising the sample of GPs against the population of Australian GPs. Encounter weights were based on GP age, sex and activity level. Weights were applied when estimating population parameters.

Conventional simple random sample statistical methods were used for GP-based analyses. These included tests for categorical data and linear regression for ordinal or numeric outcomes.

Cluster samples violate the assumptions of simple random sample designs as the encounters for each GP were not independent of each other. Therefore the significance tests for encounter-based analyses were corrected for the design effect of the cluster sample, using methods incorporated into SAS version 8.2.

Changes in GP characteristics over time were tested with the chi square statistic.

Results

After post-stratification weighting for GP age (within sex) and activity level there were 96,901 encounters in 1998–99, 104,856 in 1999–00 and 99,307 in 2000–01. Total pathology test orders numbered 23,872 in 1998–99, 27,613 in 1999–00 and 29,225 in 2000–01.

Changes in pathology ordering rates

Between 1998–99 and 2000–01 there was a significant increase in the overall rate of pathology tests ordered, from 24.6 per 100 encounters to 29.4 per 100 encounters, an increase of 4.8 test orders per 100 encounters, or 19.5%. This increase was not due to any increase in the number of problems managed at encounter. Pathology test orders per 100 problems managed increased by 3.1 test orders, or 17.4%, from 17.8 per 100 problems managed to 20.9 per 100.

Pap smears represent a preventive procedure encouraged in general practice and the community, and they are conducted far more often by female GPs. Hence their inclusion in the analysis may have not been appropriate, as patterns of their ordering would have influenced total order rates. When Pap smears were excluded, the increase in ordering was still apparent, from 23.1 per 100 encounters to 28.0 per 100 (an increase of 4.9 per 100 encounters, or 21.2%) and from 16.3 per 100 problems to 19.9 per 100 (an increase of 3.6 test orders per 100 problems, or 22.1%). The remainder of this report is based on pathology test orders after the removal of Pap smears from the analysis. There was no real change in the proportion of encounters generating one or more pathology test orders but there was a small though significant increase in the likelihood of GPs ordering at least one test for a problem managed, from 9.1% in 1998–99 to 9.7% in 2000–01 ($p=0.006$).

Where pathology was ordered, there was an increase in the number of tests ordered for each problem, from 180 per 100 tested problems in 1998–99 to 205 per 100 in 2000–01, an average increase of 14.5 tests per 100 tested problem, per year. This result reflected an overall move to multiple test orders and away from ordering a single test for the problem.

The types of tests ordered

When the pathology tests ordered were considered in terms of the more common Medicare Benefits Schedule (MBS) pathology groups for general practice, it was apparent that the major increase in order rates was in the Chemical pathology class, from 11.3 per 100 encounters in 1998–99 to 15.4 per 100 in 2000–01, an increase of 36.3% ($p<0.0001$). Tests classed as Haematology also increased but to a lesser extent, from 5.1 to 5.7 per 100 encounters in 2000–01, an increase of 11.7% ($p=0.0093$). Linear regression analysis suggested that there had been a significant but marginal increase in order rates for Histopathology ($p=0.0160$) and a small but significant decrease of 0.1 test per 100 encounters in tests classed as Infertility ($p<0.0001$). There were no other MBS pathology groups for which order rates changed significantly over the period of the study.

The top sixteen test types accounted for 75% of all pathology tests. Significant increases in order rates were apparent for full blood counts, lipid tests, glucose, electrolyte, urea and creatinine (EUC) tests, multibiochemical analysis and hormone assays. Order rates for erythrocyte sedimentation rate (ESR), urine microscopy, culture and sensitivity (MC&S), and hepatitis/serology remained constant over time.

Characteristics of the GPs

The characteristics of GPs participating in the BEACH program have changed significantly over time and but most of these differences disappeared after post-stratification weighting for the known under-representation of young (<35 years) GPs in the sample compared with the total GP population. Changes in characteristics of the total sample frame (represented by the weighted data) were a significant increase in the proportion of GPs who graduated outside Australia (from 21.7% to 25.0%) and a significant change in distribution across states (though the pattern of change over the years was not clear). While the sample of participating GPs was significantly older in 2000–01 than in 1998–99, this difference disappeared after post-stratification weighting. We can conclude that the GP population as a whole was not significantly older in the latest year than in the earliest year of the study.

The relationship between GP characteristics and pathology ordering rates

GP sex: Female GPs were significantly more likely to order at least one pathology test than their male counterparts and this was confirmed as significant by linear regression. Female GPs had significantly higher pathology test rate of 21.2 orders per 100 problems managed than males (17.3 per 100). However, once the decision was made to order pathology there was no difference in the number of tests ordered per 100 tested problems.

GP age: Linear regression demonstrated a significant inverse relationship between GP age and pathology ordering rates. However, the relationship was not strictly linear. GPs aged 35–44 years had the highest pathology ordering rate (30.4 tests per 100 encounters) and those aged 55 years or more the lowest (22.0 per 100). GPs aged less than 35 years ordered significantly more tests than those aged 45 years or more but about the same as those of 35–44 years. After the decision to order pathology was made there was a steady and significant inverse linear relationship between the age group of the GP and the number of tests. GPs aged less than 35 years ordered 206 per 100 tested problems and the rate steadily decreased with GP age group to 180 per 100 problems managed for GPs of 55 years or more.

Size of practice: There was a significant linear relationship between the size of the practice and pathology test ordering rates—the larger the practice the higher the rate, solo GPs ordering 22.5 tests per 100 encounters and those in larger group practices of 5 or more GPs 28.8 tests per 100 encounters. GPs did not differ according to their practice size in the average number of tests ordered once the decision to place an order had been made.

Practice location: GPs practising in rural and remote areas had a significantly higher pathology ordering rate (29.9 per 100 encounters) than those working in urban areas (25.7 per 100). There were no significant differences in the pathology ordering rates between states and territories.

Multiple regression found that the higher rates of pathology orders among female GPs applied across all age groups and in each of the three years of the study. Decreased pathology ordering with increasing GP age was also demonstrated to be true for all three years of the study and for both sexes. However, there remained an increase in pathology ordering over time that was not accounted for by GP age and sex.

The purpose for which pathology tests were ordered

There was a small change in the overall distribution of the pathology tests over time, which resulted in a significant decrease in the proportion of pathology tests classed as *monitoring* pathology (from 41.3% to 37.1%). The 22% overall increase in the relative rate of pathology test orders was reflected in significant increases in all pathology classes—*diagnostic pathology*, *monitoring pathology*, *preventive care pathology* and *other pathology*. It was reflected well in the increase in diagnostic pathology (increase of 26%) and preventive care pathology (26%) but not in *monitoring pathology* (13%). The increase in *other pathology* (tests connected to ill-defined labels) rose at double the average rate (41%).

The problems for which pathology tests were ordered

There were five commonly managed problems with significant increases in pathology ordering rates between 1998–99 and 2000–01: hypertension (from 11.9 to 20.4 test orders per 100 contacts), diabetes (from 47.5 to 60.1), menopausal symptoms (from 17.5 to 28.2), ischaemic heart disease (from 22.4 to 33.1 per 100 problem contacts) and cardiovascular check-ups (from 10.8 to 17.2 per 100 problem contacts).

Multiple regression was used to investigate the relationship between problem types, pathology ordering rates and time. The results demonstrated that there had been a significant increase in pathology ordering rates for lipid disorders, thyroid problems and weakness/tiredness which had a considerable impact on total pathology tests ordered and reflected the overall increase in pathology ordering. However, increases in pathology test ordering rates for all blood pressure problems, other cardiovascular morbidity and diabetes were significantly greater than the overall increase, indicating an accelerated change in the pathology ordering for each of these problems. As their rate of management is high, the impact on total pathology test orders would be considerable. For lipid disorders and diabetes there were also increased management rates, producing an additive effect on the total pathology ordered for these problems over time. Together, increases in pathology test orders plus or minus increases in management rates for cardiac check-ups, diabetes, hypertension, menopausal symptoms and ischaemic heart disease explained an additional 1.5 million test orders nationally in 2000–01 compared with 1998–99.

The relationship between pathology test orders and other management

Prescribing: There was a significant inverse relationship between pathology test ordering and prescribing, such that the more pathology tests ordered for a problem, the fewer prescriptions. However, this did not result in a significant decrease in the total number of medications prescribed at all encounters over time.

Imaging: There was a significant positive relationship between imaging order rates and pathology ordering rates. There was also a significant increase in rates of imaging orders over time. It is unlikely that there is a direct causal relationship between imaging and pathology orders however, the same underlying factors that influence pathology ordering rates may also affect imaging order rates.

Therapeutic procedure: Linear regression demonstrated an inverse relationship between therapeutic procedures and pathology rates ($p<0.0001$), the more pathology, the fewer therapeutic procedures. However, this did not result in a significant decrease in the number of therapeutic procedures recorded over time.

Clinical treatments: Multiple regression showed no relationship between the number of pathology tests ordered and provision of clinical treatments (e.g. advice and counselling). A significant increase in rates of provision of clinical treatments from 21.6 to 25.8 per 100 in 2000–01 ($p<0.0001$) was not related to pathology ordering.

The relationship between pathology test orders and length of consultation

There was no significant change in the distribution of Medicare A1 items of service (Levels A, B, C, D) over the study period. However, there was a strong linear relationship between Medicare item level and pathology test ordering rates, the rate increasing from about 8–10 pathology test orders per 100 encounters claimable at Level A, to 60–70 test orders for encounters claimable at Level D. The Medicare item level remained a significant predictor of pathology ordering rates after adjusting for the problems managed. These findings were supported by a demonstrated significant relationship between consultation length (in minutes) and pathology test ordering, even after adjustment for the number of problems managed at the encounter.

Factors predicting pathology ordering rates

Simple linear regression demonstrated that the significant univariate predictors of pathology when fitted alone were:

- GP sex
- GP age
- place of graduation
- years in general practice
- size of practice location (both state/territory and urban/rural)
- sessions per week
- sex of patients
- proportion of patients aged less than five years, 5–14 years and 45–64 years
- management rates of most types of problems (with the exception of those associated with the ear, the eye, the musculoskeletal and neurological systems)
- Medicare item level claimed *and*
- duration of encounter.

Multiple regression identified the independent predictors of pathology ordering rate. The final model explained 31.9% of the variance in pathology ordering rates. After adjusting for all other significant factors, higher ordering rates were associated with GPs:

- in larger practices
- in rural and remote practices
- with higher proportions of working-age adult patients (15–64 years)

- with higher management rates of problems associated with the blood and blood-forming organs, the endocrine and metabolic system, the circulatory and urinary systems and those related to pregnancy and family planning *and*
- with higher rates of Medicare Level C consultations.

However, after adjustment for all these factors there remained an unexplained increase in pathology ordering rates over time.

Conclusion

There was a significant increase in pathology test ordering rates by GPs between 1998–99 and 2000–01. There was a relatively small increase in the proportion of problems for which pathology was ordered but there was a move away from ordering a single test per problem to ordering 3 or more tests per episode. The major increase was in orders for Chemical pathology followed by Haematology, with a smaller but significant increase in Histopathology. The increases are reflected in pathology ordered for all purposes, particularly for diagnostic and preventive care and other pathology, and to a lesser extent in monitoring pathology.

While order rates are significantly related to GP characteristics, there has been no change in the characteristics of practising GPs so this relationship cannot be the cause of increased pathology test orders. Some of the increase can be explained by increased management rates of a few common conditions. However, the majority of the measured increase cannot be explained by factors measured in this study. External influences such as the introduction of new MBS item numbers, system changes such as increased computerisation and possibly increased fear of litigation must be considered as possible influences on pathology ordering rates of GPs over the period of this study.