

REVIEW ARTICLE

Determinants of an urban origin student choosing rural practice: a scoping review

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ABSTRACT

Introduction: The shortage of physicians in rural and remote communities is an ongoing problem. Many studies have shown that the rural background of a student (ie rural origin) is a primary factor in recruiting physicians for practice in rural communities. Scoping reviews are primarily done to gauge the extent of literature on the research question at hand, typically with an intent that future research in that area is a constructive addition to pre-existing knowledge. This scoping review focuses on factors that predispose urban-origin students to choose a career in rural medicine.

Methods: The study used Arksey and O'Malley's guidelines for a scoping review of the literature, which, in contrast to a traditional systematic review, is brief yet comprehensive. Medline (Ovid) and PubMed databases were used to review literature published between 1 January 1970 and 30 November 2014. After removing duplicates, articles were screened based on inclusion and exclusion criteria set up by the research team. The literature search resulted in 435 articles, 418 of which were excluded, leaving 17 articles for comprehensive review.

Results: Out of these 17 studies, the following four factors that suggest why urban-origin medical students may choose rural practice were generated: geographic diffusion of physicians in response to economic forces such as debt repayment and financial incentives (five studies), scope of practice and personal satisfaction (five studies), undergraduate and postgraduate rural training (nine studies) and premedical school mindset to practice rurally (five studies).

Conclusions: Urban-origin students may choose rural practice because of market forces as well as financial incentives. The participation in undergraduate and postgraduate rural training is reported to positively alter the attitude of urban-origin students. A small subset of these students has a predetermined mindset to practice rurally at the time of matriculation. Obstacles for choosing a



rural carrier include, but are not limited to lack of job and education opportunities for spouses/partners, lack of recreational and educational opportunities for children, and obscure opportunities for continuing medical education.

Key words: career, debt repayment, economic forces, pre-medical school mindset, rural medicine, rural training, rural-origin students, scope of practice, scoping review, urban-origin students.

Introduction

The unequal geographical distribution of physicians in Australia, Canada and the USA has been a major challenge for policy developers¹. Over the past 50 years, numerous attempts, including financial incentives, tuition fee reimbursement, and increased rural learning opportunities have been made to recruit and retain doctors in rural and remote areas. Clear evidence that students with rural backgrounds are more likely to choose rural practice²⁻⁴ has led to recruitment efforts being focused primarily on rural origin learners^{1,5}. Subsequent to medical school admission, there is a substantial published literature on the effects of rural training programs on students that seek to motivate them to practice in rural areas^{6,7}. These rural training programs may include shadowing experiences, short mandatory or elective rotations, and rural longitudinal integrated clerkships ranging from 3 months to a complete year⁷⁻⁹.

The pool of rural-origin students entering medical school is diminishing^{8,10-12}. This trend aggravates the persistent shortage of physicians in rural and underserved communities and undermines the traditional program or governmental response. In addition, there is a trend amongst rural origin physicians to relocate to urban areas and establish practice¹³⁻¹⁵ supporting the need to study factors that motivate urban-origin students in choosing rural practice.

According to Arksey and O'Malley, a scoping review is a specific literature review in which emphasis is placed on techniques to rapidly map key concepts in pertinent literature in the field of interest. The purpose of a scoping review

generally is to highlight the key concepts supporting a research area and the main sources and types of evidence available. Such reviews may be undertaken as an independent project especially when the research area has not been previously reviewed extensively¹⁶. Since quality of evidence is not assessed, it cannot be established whether particular studies provide robust or generalizable findings. A strong scoping statement, as well as definite inclusion and exclusion criteria applied to each paper identified, are prerequisites to prevent irrelevant material from being included within the study and to certify that the results meet the needs of the research question. The results of the review are summarized by thematic construction in order to present a narrative account of existing literature. The paucity of number of articles does not influence development of themes and each article can have multiple themes. Each step is documented and the results are listed to ensure repeatability of the study¹⁷.

Our research question was, 'What factors are responsible for rural recruitment and retention of urban-origin students?' The present article is a scoping review of the existing literature that specifically considers factors that promote urban-origin students to choose medical practice in a rural community. This allows the development of potential research questions for future studies targeting urban-origin students who choose a career in rural medicine.

Methods

Ovid Medline (Appendix I) and PubMed (Appendix II) databases were searched for articles nationally and internationally. MeSH terms, keywords and truncations were



used with titles and abstracts for the search. The search was limited by date and language. Only articles published in the English language between 1 January 1970 and 30 November 2014 were included. The PubMed database was searched initially with the broad theme of 'rural retention of physicians' to retrieve a maximum number of articles on the topic. It resulted in 249 articles in total under this theme. The Medline database was searched in a similar way, but with the more specific terms listed in the appendix in the advanced search option. The themes under which the search was narrowed were:

- determinants for urban-origin students practicing in rural community (25 articles)
- determining factors for rural retention of doctors (31 articles)
- determinants of Manpower in rural community (171 articles).

EndNote X7 was used to import references from Medline and PubMed databases. The articles were grouped together and duplicates removed. In combining lists from both databases, and after removing duplicates, 435 articles were identified; 186 articles were shortlisted from Medline and 249 from PubMed.

An Excel spreadsheet was designed with Microsoft Excel 2013 and used for screening the searched articles. The sheet was designed so that it contained the required information on inclusion and exclusion criteria noted below. Each article was required to pass the mandatory screening requirements to be included in the review study. Of these, articles that discussed factors influencing urban-origin students to choose rural practice were extracted for further review.

The following questions were the basis of the inclusion/exclusion criteria (Appendix III):

1. Does the paper contain information regarding rural retention/rural practice of physicians?
2. Was the paper published between 1 January 1970 and 30 November 2014?

3. Is the paper from a peer-reviewed journal?
4. Does the article have an abstract?
5. Is the paper written in English?

Once a paper was determined to have met the criteria, it was screened further (Appendix III) for information about:

1. urban-origin physicians
2. factors related to urban-origin physicians choosing rural practice
3. factors that led to retention of an urban-origin physician to stay in rural practice for longer than 5 years
4. trends in rural migration of physicians.

Based on the inclusion criteria, 306 articles were identified. Two researchers worked separately and independently to complete the screening process. These results were subsequently compared and discrepancies were resolved by revisiting the inclusion criterion.

Applying exclusion criteria, 31 articles were identified discussing factors that potentially lead urban-origin students to choose rural practice. Further analysis excluded 14 more articles due to lack of specific information addressing the research question; 17 articles were finally accepted for the scoping review.

Results

Table 1 shows the geographic distribution and type of studies conducted. Four themes were developed to summarize the information. These themes, in a broader sense, encompass the potential driving forces that may influence the choice of a rural career by urban-origin students. The total number of articles is greater than 17 studies because some measured more than one outcome (Table 1).



Table 1: Types of studies and the country where research was done^{10,14,18-35}

Category	No. of articles	Article reference (no.)
Factors developed		
Geographic diffusion of physicians in response to economic forces: debt repayment and financial incentives	5	Rabinowitz et al. 1999 (14), Pathman et al. 2000 (18), Pathman et al. 2004 (19), Azer et al. 2001 (20), Ricketts and Randolph 2007 (21)
Breadth of scope of practice and personal satisfaction	5	Stenger et al. 2008 (10), Pathman et al. 2004 (19), Rubenstein et al. 1975 (22), Pathman et al. 1996 (23), Scammon et al. 1994 (24)
Undergraduate and postgraduate rural training	9	Stenger et al. 2008 (10), Verby and Connolly 1972 (25), Myhre et al. 2015 (26), Eley and Baker 2007 (27), Kane et al. 2013 (28), Wilkinson et al. 2003 (29), Tate and Aoki 2012 (30), Szafran et al. 2013 (31), Stagg et al. 2009 (32)
Pre-medical school mindset to practice rural	5	Rabinowitz et al. 1999 (14), Pathman et al. 2000 (18), Rubenstein et al. 1975 (22), Veitch and Crossland 2005 (34), Taylor et al. 1973 (35)
Evaluation design/type of study		
Focus group research	2	Scammon et al. 1994 (24), Pong 2008 (33)
Cross-sectional survey/questionnaire based	11	Stenger et al. 2008 (10), Pathman et al. 2000 (18), Pathman et al. 2004 (19), Azer et al. 2001 (20), Rubenstein et al. 1975 (22), Pathman et al. 1996 (23), Verby and Connolly 1972 (25), Eley and Baker 2007 (27), Tate and Aoki 2012 (30), Szafran et al. 2013 (31)
Longitudinal study	1	Rabinowitz et al. 1999 (14)
Pre-post questionnaire	1	Kane et al. 2013 (28)
Practice location	9	Rabinowitz et al. 1999 (14), Pathman et al. 2000 (18), Pathman et al. 2004 (19), Ricketts and Randolph 2007 (21), Verby and Connolly 1972 (25), Tate and Aoki 2012 (30), Szafran et al. 2013 (31), Stagg et al. 2009 (32), Pong 2008 (33)
Country of study		
Australia	3	Azer et al. 2001 (20), Eley and Baker 2007 (27), Stagg et al. 2009 (32)
Canada	4	Pathman et al. 2004 (19), Tate and Aoki 2012 (30), Szafran et al. 2013 (31), Pong 2008 (32)
USA	9	Stenger et al. 2008 (10), Rabinowitz et al. 1999 (14), Pathman et al. 2000 (18), Pathman et al. 2004 (19), Ricketts and Randolph 2007 (21), Pathman et al. 1996 (23), Scammon et al. 1994 (24), Verby and Connolly 1972 (25), Kane et al. 2013 (28)
Miscellaneous	1	Rubenstein et al. 1975 (22)

1. Geographic diffusion of physicians in response to economic forces: debt repayment and financial incentives

One factor that motivates urban-origin students to choose a rural career is the taut competition they face in an urban location after completing their medical education. Both rural- and urban-origin students often acquire significant debt during medical school with approximately 80% of medical

students in the USA carrying loans from \$100 000 to \$150 000 at the time of graduation¹⁸. High debt load and the risk of establishing a practice in a competitive market promote the movement of physicians to locations where economic opportunities are more apparent. This debt stress may then be aggravated upon graduation as competing financial priorities such as home mortgages, practice costs, and family expenses build. Some urban-origin students may choose rural practice to ease this financial burden. Provincial,



state and federal governments, in an attempt to lure physicians to rural or underserved communities, may provide loan repayment options, which are frequently combined with direct financial incentives such as fee-for-service rural surcharges¹⁸. Debt repayment policies such as a waiver of full or partial tuition fees or in-kind benefits from the rural community/town council act as instant financial relief for urban-origin students¹⁹. Although the burden of work is greater in rural and underserved communities, these loan repayment options and higher fees for service motivate urban-origin students to relocate rurally¹⁴. Migration has been seen to rural areas that are located near an urban or suburban center, possibly to reap the benefits of both worlds. Frequent travel is possible when a physician lives in close proximity to a major urban center²⁰. The decision to choose rural practice may also be seen to generate higher and more secure compensation²¹.

2. Breadth of scope of practice and personal satisfaction

New graduates tend to move to rural locations to gain valuable experience and confidence. Family physicians who choose to practice in rural locations are those who feel satisfied in their professional life due to opportunities available in those areas²². Physicians have reported that closer contact with patients in a rural setting establishes better doctor–patient relationships, thereby increasing role satisfaction²². The fact that fewer specialists work in rural areas may broaden the scope of practice for generalist/family physicians, leading to overall high job satisfaction in rural physicians¹⁹. The increased spectrum of services a rural family physician provides often exceeds that of their urban counterpart, leading to a challenging career that may be attractive to urban-origin students. Furthermore, it has been reported that rural physicians feel more appreciated in the community they serve, which results in increased satisfaction in spite of the increased workload¹⁰. Broader scope practices and the ability to become integrated into the local community appear to ultimately help urban-origin physicians to achieve their professional goals^{23,24}.

3. Undergraduate and postgraduate rural training

The concept of medical education in a rural setting was introduced in the 1970s in the USA in an attempt to bridge the gap between demand and supply of physicians in rural areas²⁵. Since implementation, various rural medical education programs have proven their effectiveness²⁶. Rural undergraduate or postgraduate training broadens the horizons of urban-origin students who have never explored beyond the boundaries of their urban centers. Learners begin to appreciate the diversity of patients they treat and feel more valued in their profession. The success of rural medical education/training depends on factors that include quality of teaching, level of student–preceptor contact, dedicated patient panels and accommodation arrangements²⁷. Subsequent to completing their rural training, students have been reported to show more interest in working in rural areas. Urban-origin students who participate in rural training are more inclined to choose family medicine residencies and become generalists²⁸. The duration of rural postgraduate training in a rural area is positively correlated with the choice of rural practice by that physician²⁹. Moreover, rural training facilitates an urban-origin student's understanding of the cultural aspects of rural practice, which further promotes amalgamation within the community^{10,30-32}.

4. Premedical school mindset to practice rurally

A small number of studies identified an important, yet under-recognized, consideration that some urban-origin students enter medical school with the intention of practicing in a rural community. These urban-origin students may be an untapped resource in the effort to resolve the problem of shortage of physicians in rural areas. Their choice for rural practice should be reinforced by frequent exposures to rural rotations²². Little is known about the factors that lead to this predetermined career preference²².

According to Rabinowitz et al¹⁴, the existing intent to practice rurally at matriculation is clearly an independent predictor of rural retention. As depicted in their analysis, even after three decades of graduation from medical school,



urban-origin physicians who intended to practice rurally at the time of matriculation continued to practice in rural and underserved communities. Furthermore, urban-origin physicians who have a partner of rural origin at time of matriculation have a higher chance of having a mindset to practice rurally^{19,34,35}.

Discussion

External factors promoting rural practice to urban-origin students are identified in two of the four themes. Market and economic forces observed in the last decade along with government-based loan repayment and financial incentives play a role in the redistribution of physicians. These economic drivers do not simply apply to the physician alone, but at times are equally important for their partner¹⁹. It appears that physicians who are retained in a rural practice for a longer duration are those whose spouse/partner is able to find work in a rural community.

Rural medical education and rural postgraduate training have had a positive impact in changing the attitudes of urban-origin students in the consideration of a rural practice³⁴. Those urban-origin students who have had a successful experience may also motivate peers to enroll in rural clerkships/rotations to enrich their experience and explore opportunities²⁶. These rural training opportunities should be longer in duration to create a more meaningful experience for the learner²⁶.

Two of the four themes consider factors that are not under the control of training programs, institutions or governments. An individual physician determines the value that a broad scope of practice and procedural opportunities holds. This breadth of practice does appear to be linked with the sense of fulfillment or value the physician appreciates. The theme does suggest that those undergraduates who value this practice characteristic could be offered such an opportunity in a smaller community as they are increasingly rare in urban centers.

Finally, those that have developed a mindset to practice rurally at the pre-medical school stage should be identified early in their career with the intent to reinforce this interest. One explanation for this mindset may be that urban-origin students possibly engage in trend analyses of supply and demand of physicians before the start of their medical education. Clearly, further studies should be done to identify this group of students early and to understand their motivation and decision process.

In addition to these themes that reflect primary factors promoting a career in rural medicine, our process also identified many obstacles for urban-origin students to practice in a rural setting. Some of the obstacles identified include career and job opportunities for spouses, educational and recreational opportunities for children, and continuing medical education for the physicians^{20,22}. Other factors that may form a barrier to choosing rural medicine are feelings of isolation, remoteness from an urban area and lack of coverage for vacations. Potential solutions to these problems might lie in the development of remote continuing medical education and faculty development programs. Policies should be developed by governing bodies to address the issue of coverage for vacations by arranging for replacement physicians¹³. Further research should be conducted specifically to find solutions to these obstacles faced by urban-origin students.

Conclusions

This scoping review has identified themes for consideration in addressing the potential of urban-origin medical undergraduates to help address the maldistribution of physicians in rural communities. Further research to clarify the factors that promote a rural focus in urban-origin students prior to beginning training, and to support them through their education, may uncover a means to add a new pool of rural recruits and therefore help to bridge the gap between demand and supply of physicians in rural and underserved communities.



References

1. Heng D, Pong RW, Chan BT, Degani N, Crichton T, Goertzen J, et al. Graduates of northern Ontario family medicine residency programs practise where they train. *Canadian Journal of Rural Medicine* 2007; **12(3)**: 146-152.
2. Yeganeh-Arani E, Chandratilake M, Muula AS. Factors affecting career preferences of medical students at the College of Medicine, Malawi. *South African Medical Journal* 2012; **102(4)**: 249-251.
3. Beauchamp J, Belanger M, Schofield A, Bordage R, Donovan D, Landry M. Recruiting doctors from and for underserved groups: does New Brunswick's initiative to recruit doctors for its linguistic minority help rural communities? *Canadian Journal of Public Health* 2013; **104(6 Suppl 1)**: S44-S48.
4. de Vries E, Reid S. Do South African medical students of rural origin return to rural practice? *South African Medical Journal* 2003; **93(10)**: 789-793.
5. Alexander C, Fraser JD. Education, training and support needs of Australian trained doctors and international medical graduates in rural Australia: a case of special needs? *Rural and Remote Health* **7(2)**: 681. (Online) 2007. Available: www.rrh.org.au (Accessed 20 November 2014).
6. Acosta DA. Impact of rural training on physician work force: the role of postresidency education. *Journal of Rural Health* 2000; **16(3)**: 254-261.
7. Verby JE. The Minnesota Rural Physician Associate Program for medical students. *Journal of Medical Education* 1988; **63(6)**: 427-437.
8. Kassebaum DG, Szenas PL. Rural sources of medical students, and graduates' choice of rural practice. *Academic Medicine* 1993; **68(3)**: 232-236.
9. Myhre DL, Hohman S. Going the distance: early results of a distributed medical education initiative for Royal College residencies in Canada. *Rural and Remote Health* **12**: 2151. (Online) 2012. Available: www.rrh.org.au (Accessed 20 November 2014).
10. Stenger J, Cashman SB, Savageau JA. The primary care physician workforce in Massachusetts: implications for the workforce in rural, small town America. *Journal of Rural Health* 2008; **24(4)**: 375-383.
11. Easterbrook M, Godwin M, Wilson R, Hodgetts G, Brown G, Pong R, et al. Rural background and clinical rural rotations during medical training: effect on practice location. *Canadian Medical Association Journal* 1999; **160(8)**: 1159-1163.
12. Lu DJ, Hakes J, Bai M, Tolhurst H, Dickinson JA. Rural intentions: factors affecting the career choices of family medicine graduates. *Canadian Family Physician* 2008; **54(7)**: 1016-1017.
13. Mateen FJ. Future practice location and satisfaction with rural medical education: survey of medical students. *Canadian Family Physician* 2006; **52(9)**: 1106-1107.
14. Rabinowitz HK, Diamond JJ, Hojat M, Hazelwood CE. Demographic, educational and economic factors related to recruitment and retention of physicians in rural Pennsylvania. *Journal of Rural Health* 1999; **15(2)**: 212-218.
15. Davies P. A comparison of rural and non rural RACGP training program trainees. Royal Australian College of General Practice. *Australian Family Physician* 1994; **23(7)**: 1330-1333, 1336.
16. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology* 2005; **8(1)**: 19-32.
17. Landa AH, Szabo I, Le BL, Owen I, Fletcher G, Hill M. An evidence-based approach to scoping reviews. *Electronic Journal of Information Systems Evaluation* 2011; **10(4)**: 173-175.



18. Pathman DE, Konrad TR, King TS, Spaulding C, Taylor DH. Medical training debt and service commitments: the rural consequences. *Journal of Rural Health* 2000; **16(3)**: 264-272.
19. Pathman DE, Konrad TR, King TS, Taylor DH, Jr, Koch GG. Outcomes of states' scholarship, loan repayment, and related programs for physicians. *Medical Care* 2004; **42(6)**: 560-568.
20. Azer SA, Simmons D, Elliott SL. Rural training and the state of rural health services: effect of rural background on the perception and attitude of first-year medical students at the University of Melbourne. *Australian Journal of Rural Health* 2001; **9(4)**: 178-185.
21. Ricketts TC, Randolph R. Urban-rural flows of physicians. *Journal of Rural Health* 2007; **23(4)**: 277-285.
22. Rubenstein LZ, Rubenstein L, Elkin P, Elkin SP. Determinants of the choice of rural practice: a study of Yugoslav general practitioners. *Journal of Medical Education* 1975; **50(6)**: 615-623.
23. Pathman DE, Williams ES, Konrad TR. Rural physician satisfaction: its sources and relationship to retention. *Journal of Rural Health* 1996; **12(5)**: 366-377.
24. Scammon DL, Williams SD, Li LB. Understanding physicians' decisions to practice in rural areas as a basis for developing recruitment and retention strategies. *Journal of Ambulatory Care Marketing* 1994; **5(2)**: 85-100.
25. Verby JE, Connolly JP. Rural physician's associate program. *Journal of Medical Education* 1972; **47(11)**: 907-908.
26. Myhre DL, Adamiak PJ, Pedersen JS. Specialty resident perceptions of the impact of a distributed education model on practice location intentions. *Medical Teacher* 2015; **37(9)**: 856-861.
27. Eley DS, Baker PG. Will Australian rural clinical schools be an effective workforce strategy? Early indications of their positive effect on intern choice and rural career interest. *Medical Journal of Australia* 2007; **187(3)**: 166-167.
28. Kane KY, Quinn KJ, Stevermer JJ, Porter JL, Webb WD, Williamson HA Jr, et al. Summer in the country: changes in medical students' perceptions following an innovative rural community experience. *Academic Medicine* 2013; **88(8)**: 1157-1163.
29. Wilkinson D, Laven G, Pratt N, Beilby J. Impact of undergraduate and postgraduate rural training, and medical school entry criteria on rural practice among Australian general practitioners: national study of 2414 doctors. *Medical Education* 2003; **37(9)**: 809-814.
30. Tate RB, Aoki FY. Rural practice and the personal and educational characteristics of medical students: Survey of 1269 graduates of the University of Manitoba. *Canadian Family Physician* 2012; **58(11)**: e641-e648.
31. Szafran O, Crutcher RA, Woloschuk W, Myhre DL, Konkin J. Perceived preparedness for family practice: does rural background matter? *Canadian Journal of Rural Medicine* 2013; **18(2)**: 47-55.
32. Stagg P, Greenhill J, Worley PS. A new model to understand the career choice and practice location decisions of medical graduates. *Rural and Remote Health* **9(4)**: 1245. (Online) 2009. Available: www.rrh.org.au (Accessed 20 November 2014).
33. Pong RW. Strategies to overcome physician shortages in northern Ontario: a study of policy implementation over 35 years. *Human Resources for Health* 2008; **6**: 24.
34. Veitch C, Crossland LJ. Medical family support needs and experiences in rural Queensland. *Rural and Remote Health* 2005; **5(4)**: 1-11. (Online) 2005. Available: www.rrh.org.au (Accessed 20 November 2014).
35. Taylor M, Dickman W, Kane R. Medical students' attitudes toward rural practice. *Journal of Medical Education* 1973; **48(10)**: 885-895.



Appendix I: Search strategy for articles from Medline

- Determinants of an urban-origin student practicing rural community (25 articles)
 1. Rural Health/
 2. students/ or students, health occupations/
 3. Students, Medical/
 4. general practitioners/ or physicians, family/ or physicians, primary care/
 5. exp Family Practice/
 6. 2 or 3
 7. 4 or 5
 8. 1 and 6 and 7
 9. limit 8 to english language
 10. limit 9 to yr="1970 - 2014"

- Determinant factors for rural retention of doctors (31 articles)
 1. rural practice*.mp.
 2. family practice*.tw.
 3. exp Family Practice/
 4. exp Physicians, Family/
 5. exp Rural Health Services/
 6. exp Rural Health/ or exp Rural Population/
 7. 2 and 4 and 5 and 7
 8. 1 or 6 or 8
 9. exp Professional Practice Location/ or practice location.mp.
 10. urban student*.mp.
 11. exp Urban Population/
 12. 11 or 12 or 13
 13. limit 14 to english language
 14. limit 15 to yr="1970 - 2014"

- Determinants of Manpower in rural community (171 articles)
 1. family practice*.mp.
 2. exp Family Practice/
 3. exp Physicians, Family/
 4. exp Professional Practice Location/ or practice location.mp.
 5. exp Rural Health Services/ma[Manpower]
 6. family physician*.mp.
 7. 1 or 2 or 3 or 6
 8. 4 and 5 and 7
 9. limit 8 to english language
 10. limit 9 to yr="1970 - 2014"

Appendix II: Search strategy for articles from PubMed

[rural[All Fields] AND["retention[psychology]"[MeSH Terms] OR["retention"[All Fields] AND ["psychology]"[All Fields]] OR "retention[psychology]"[All Fields] OR "retention"[All Fields]] AND["physicians"[MeSH Terms] OR "physicians"[All Fields]] AND["1970/01/01"[PDAT]: "2014/11/30"[PDAT]]



Appendix III: Flowchart for screening of articles

