Submission No 670

INQUIRY INTO HEALTH OUTCOMES AND ACCESS TO HEALTH AND HOSPITAL SERVICES IN RURAL, REGIONAL AND REMOTE NEW SOUTH WALES

Organisation: The University of Newcastle Australia, Department of Rural Health

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Submission: Health outcomes and access to health and hospital services in rural, regional and remote New South Wales

Introduction

As the Chair of Rural Health and the Director of the University of Newcastle Department of Rural Health (UONDRH) I welcome the opportunity to present a submission to the Parliament of New South Wales Portfolio Committee No. 2 – Health Inquiry, 'Health outcomes and access to health and hospital services in rural, regional and remote New South Wales' on behalf of the University of Newcastle .I am also happy to present to any hearings or discussions the committee may choose to hold.

The UONDRH supports nursing, midwifery, allied health and medical students undertaking a rural, regional or remote (RRR) clinical placement. It has Strategic partnerships with two of the University of Newcastle's (UON) key NSW Health partners – Hunter New England Health (HNELHD) and Mid North Coast Local Health District (MNCLHD) and supports University of New England (UNE) students enrolled through the Joint Medical Program (JMP).

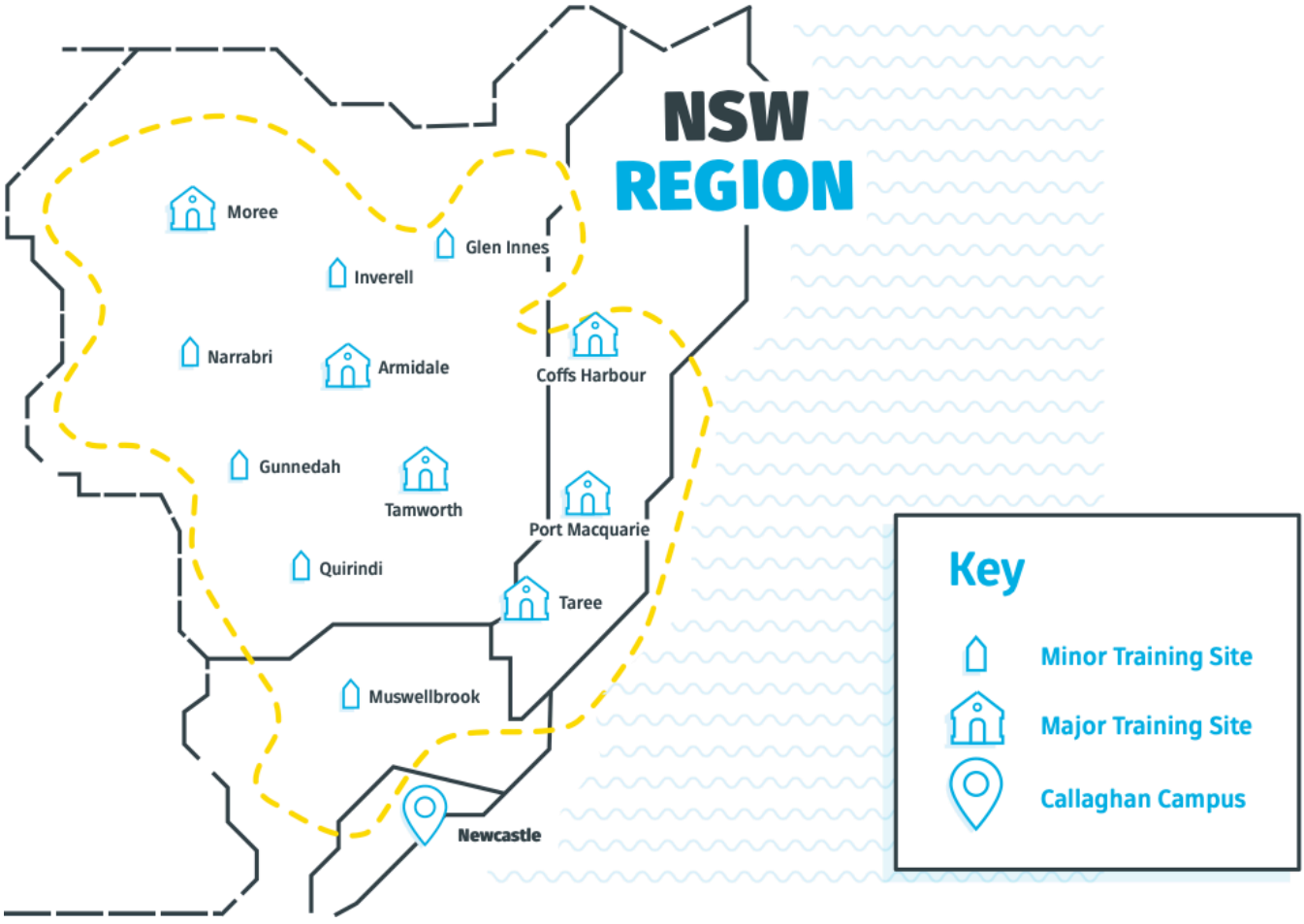
The UONDRH is headquartered at the Tamworth Education Centre (TEC) in Tamworth. Approximately 800 -1,000 students (across a variety of health disciplines) p.a. are supported by UONDRH across New England and Mid North Coast regions. There are eighty UON staff (majority are fractional appointments) employed across the six UONDRH centres.

The operational funding for these centres is provided by the Commonwealth Department of Health through the Rural Health Multi-Disciplinary Training Program (RHMT). In turn, UON provide funding (via the RHMT) to UNE to support Rural Clinical School (RCS) students based at the Tablelands Clinical School in Armidale. This funding ensures consistency of the rural experience for medical students based in either Tamworth, Taree or Armidale.

The RHMT policy objectives are to grow and enhance RRR health workforce and improve health services outside metro areas. Under these objectives, UON is contracted to deliver large numbers of allied health and nursing RRR annual placement weeks. In addition, it must also provide at least 25% of the graduating cohort of the JMP students a full clinical year in a rural location.

Tamworth, Armidale, Coffs Harbour, Port Macquarie, Moree and Taree are the main sites for student placements, although students are also supported in many smaller communities throughout the North West of NSW. The UONDRH has a number of key health research initiatives in collaboration with main campus colleagues at UON and with its major NSW Health partners.

Evidence shows that students who undertake a RRR clinical placement during their study, are more likely to return to a regional area and practice, upon graduation. This links clearly with government policy (and the RHMT objectives) to enhance the RRR health workforce and improve access to specialist health services in the regions. The UONDRH has been and continues to conduct a longitudinal tracking study into rural return rates of former students. The medical workforce research work and delivery of longitudinal placements is considered nationally as best practice with UON regarded as an exemplar. UON continues to demonstrate commitment to delivering funding and resources to rural locations resulting in high levels of place based academic support and localised pathways to build rural careers and reduce clinician turnover.



Executive summary

Rural Health services are essential to the health of rural communities.Whilst there is a need to match the service need to the population there are important core and place based services that must be supported by government. Primary and preventive care is imperative to maintain community health and wellbeing. Aged care, palliative care and on site emergency care and capacity must be available, ideally integrated with holistic primary and continous care .

Reliance on virtual care as the primary source of medical care, will fall short of best practice but should be provided to enhance and support in place clincians. Training and support of clincians with a wide scope of practice and skills is costly and expensive, however, the indirect cost born by rural communtities will be many times greater.

This is an opportune time to look at viable long term employment models with a need to review the expectations around retention and build in long term rural career and skills escalators that integrate with other opportunities in the Australian health system.

We commend the enquiry knowing that shining a spot light on the disconnect between primary and secondary care is important to ensure that the current loss of services and clinicans which are deleterious to rural communtiies is reviewed and proactively managed requiring joint and affirmative action by all parties.

Health outcomes for people living in rural, regional and remote NSW.

New England North West (NENW) NSW

Like many areas in inland NSW and relative to Australia, the New England North West region is more socioeconomically disadvantaged than the national advantage with SEIFA IRSD deciles ranging from 2 - 6 across different local government areas. Communities in the north and the west of the NENW region tended to be the most disadvantaged. People generally have lower household incomes, but lower housing costs and lower levels of mortgage/rental stress than NSW counterparts (1, 3).

There are two public rural referral hospitals in the region, located in the regional centres of Tamworth and Armidale. Two private hospitals are also located in these centres. There are nine local district hospitals located in towns with populations ranging from 2,000 - 12,000. Ten communities with populations between 1000 and 2500 have a multi-purpose service; and five towns or villages of less than 1000 people have community health-only facilities. These facilities are usually within 100km of a district hospital (4).

There is variation in the number of General Practitioners (GPs) across the region with rates ranging from 142 per 100 000 in Newcastle LGA down to 68.4 GPs per 100 000 in Moree Plains and 76 per 100 000 in Inverell (5). Not only are there fewer GPs but their breadth of practice and responsibility can be significantly increased in rural communities meaning the rates should be higher than metropolitan locations to provide adequate service levels. A small number of communities(6) in the region had access to an Aboriginal Community Controlled Health Service (6).

Importantly health outcomes are a product, not of access to care in the short term, but usually of the interaction between genetic risk factors, social determinants of health and optimal health and preventative care over the life span of the population. The NENW area has higher risk factors for poorer health outcomes such as - obesity, smoking and alcohol rates and lower per capita educational attainment than the national average (1). In addition, there are specific environmental factors such as accidents and sun exposure which are more common in rural areas.

A comparison of outcomes for patients living in rural, regional and remote NSW compared to other local health districts across metropolitan NSW.

As previously identified the separation of higher burdens of risk factors from variations of incidence and prevalence of diseases such as cardiovascular disease and cancer is key to a nuanced understanding of rural risk. There are many local differences, making it hard to generalise, but cancer and cardiovascular disease and risk are two areas where a comparison of outcomes might be useful.

Considering cancer first, there are a range of preventive and treatment cancer services available in the region. Breastscreen NSW has a regional base in Tamworth and conducts mobile outreach clinics to towns across the region. Surgical treatment of bowel, breast and prostate cancer is conducted in the public and private hospitals of Armidale and Tamworth, but lung cancer resections are performed outside the region. The North West Cancer is the only specialist cancer centre in the region and focuses on provision of medical oncology, radiation oncology and haematological services. The Centre provides a weekly outreach service to Armidale, and fortnightly service to Moree. The Centre also provides a rural multi-disciplinary cancer care team (MDT) to oversee the care of people with cancer in the region (4, 7).

There are local differences seen with all-cancers' incidence and /or mortality but caution is required with low numbers making interpretation more difficult. A number of areas of the NENW region had prostate cancer incidence and mortality 10% or more higher than the national average, with a regional incident rate around one third higher than the national average. (8) One location had almost 50% higher rates of lung cancer incidence and

mortality than the national average. Colorectal cancer incidence was 10-20% higher in 3 SA-3s (8).

Breast cancer incidence in the region was lower than the national average. Pleasingly, women of the NENW in the target age group had considerably higher rates of participation in Breastscreen programs than NSW counterparts. Lower breast cancer incidence within areas of the NENW, coincided with higher Breastscreen participation rates in the same areas; and as a region compared to NSW. Participation in National Bowel Screening Program by people of the NENW was similar to NSW (8,9).

The five-year all-cause survival for people with lung cancer in HNELHD (14%) was lower than that for NSW (20%). Similarly, the proportion of people having had a surgical resection for lung cancer was also poorer for HNELHD residents (14%) compared to NSW (20%). (10). There are no surgical treatment services for lung cancer provided within the NENW region. NENW residents with lung cancer are required to travel (up to six hours) to Newcastle to access lung cancer surgical treatment. The five-year all-cause survival for women diagnosed with breast cancer in HNELHD is similar to that for NSW (85%). The North West Cancer Centre Rural MDT oversees the care for women with breast cancer in the NENW (10).

In summary, there are rural areas within NENW which appear to have higher incidences of a number of common cancers. The treatment impact or mortality gap is hard to define using current data sets, but lung cancer statistics would appear to show lower levels of treatment and increased mortality.

There is strong existing evidence that there are different outcomes in cardiovascular disease (CVD) based on location. Nationally, residents living outside a capital city in Australia are more likely to die from CVD (11). In 2012-14, CVD death rates were 1.2 and 1.3 times higher in regional (170 deaths/100000) and remote areas (194/100K) compared to major cities (147/100K) (12). Each year in HNELHD >900 people have their first acute myocardial infarction (AMI) (13), with a 20% higher AMI risk (incident rate ratio 1.24. $p<0.001$) for those in regional locations compared to cities (11).

These differences in risk and outcomes relate both to the prevention of CVD and also to the outlook following treatment and management. They point to the dual need to address the availability of appropriate primary care and consider what improvements need to be made in the system to reduce death rates for those diagnosed. Lower rates of risk factor management, increased time to presentation at a health facility following the onset of symptoms and poorer recognition of cardiac symptoms as well as stoicism have all been reported anecdotally as contributors in rural areas.

Access to health and hospital services in rural, regional and remote NSW including service availability, barriers to access and quality of services.

As the question indicates access is about availability, affordability and acceptability. Rural services are constantly faced with reductionist forces challenging workforce, funding and services. Their locations and traditional levels of service have been a result of their geography, remoteness and historical factors. Where population is now insufficient to ensure the availability of services, it is imperative that community obligation is acknowledged, and services are provided.

Current market driven funding models utilised to ensure the smooth operation of urban hospitals and health services do not translate to regional, rural and remote hospitals and health services. Hospitals and health service delivery in regional and rural areas require a different funding model, with major block funding rather than the activity-based model utilised in the urban areas with high volumes of service. The triple bottom line approach (14) (Improving the patient experience of care (including quality and satisfaction); improving the health of populations; and reducing the per capita cost of health care) and the importance of sustainable reliable local systems of health care underpins better health outcomes (more cost effective) and better clinician retention. The understanding of the fixed cost required to provide a procedural hospital service must be front of mind where demand may not be a driver that can be manipulated to reduce unit cost.

The Modified Monash Classification (15) provides a useful way of classifying rural communities and services as it delineates function.

Appendix 1: Table 1 that identifies the different service models usually required at different population or MM levels. This may be helpful in determining the adequacy and fitness for purpose or otherwise of services. As can be seen in the table the type of service delivered very much depends on the size of the population and the geography.

For ease of understanding the table, the following information may provide further clarity:
MM3 are regional centres such as Dubbo, Lismore, Nowra, Wagga and Tamworth and have been consolidating and growing with increasing numbers of specialists.
MM4 - 5 are the district hospitals where procedural (Rural Generalist) support is needed and encompass sites including Moree and Inverell.
MM6 - 7 are more remote or dispersed smaller rural communities where primary care and aged care services are provided in small hospitals or MPSs. Bingara and Boggabri are examples of these locations.

The most pressing service gaps and workforce gaps are in MM4-5 and MM6-7 locations where the loss of procedural services and the geographic distance between facilities are greatest. It is these areas which require block funding and increased support. The loss of clinicians providing primary care services in these locations is also of great concern.

There is solid evidence for accessible high quality integrated primary care being key to reducing health service costs in the long term and increasing both longevity and quality of life (16). Starfield's work identified an increase in mortality when an increasing number of specialties were involved in care citing care coordination and prioritisation of medical issues for patients as crucially important. With the lack of access to many specialties, primary care is the only option available in some towns and by necessity, this will often provide a team based approached to patient care. The recent work around "practice homes" done by GPs through the ACI Process merits attention and can be found here: https://www.aci.health.nsw.gov.au/nhn/patient-centred-medical-home-model/what-is-the-patient-centred-medical-home-model This work builds on Starfields "home base GP practice concept".

Rurality does increase the social and economic cost to patients as well as the health system as a whole. Patients shoulder both direct and indirect costs including travel and foregoing work (increasing the financial burden). Increasing "in place" workforce levels will increase the number of patients being treated. Where primary care is inadequate or absent existing data clearly shows that avoidable hospitalisations increase (17).

Good rural primary care also makes financial sense (18) with community savings in reduced hospitalisations and diversion from Emergency Departments (ED). Currently there are some perverse incentives within the local health system as activity-based funding puts a price on ED attendance far greater than the GP rebate for a similar service.

The GP Visiting Medical Officer (VMO) model has traditionally allowed that integration to happen seamlessly for the GP VMOs patients in many of NSW rural communities. The more recent finding that only 34% of GPs in MM4-7 communities were GP VMOs identifies the gap that has arisen in the effectiveness and comprehensiveness of this model of care (19) . The availability of GP notes for patients being admitted to hospital and the encouragement of the GP VMO model were markers of this previous integration. With the loss of attractiveness of rural practice and numbers of GPs with rural intent, the link between hospital and general practice has been loosened. Further loosening and lack of local integration will be both expensive and likely less efficacious with models such as District Medical Officer models (who do not know patient or context) and FACEM led primary care

virtual models threatening continuity of patient care (already established as cost effective and beneficial to patients and the system). There are no current trials of Specialist led models of primary care in urban areas as a substitute for integrated primary and secondary care and thus it is hard to see them as other than as anything other than a poor substitute for rural and remote areas. Their use as adjunctive activities are both welcome and likely to be synergistically helpful but should not be a replacement for primary care services.

Patient experience, wait-times and quality of care in rural, regional and remote NSW and how it compares to metropolitan NSW.

As a rural GP, I can confidently state that rural patients have, in the main, reasonable expectations regarding service availability. They do not expect to have tertiary level resources delivered locally. They do expect high quality locally delivered extended primary care with aged care, palliative care and management of uncomplicated medical and surgical conditions at district hospitals. They expect the *same* level of service as in urban areas for basic emergency care (including the laying on of hands-insertion of cannula and the provision of life saving emergency procedures) in most locations with populations of >2000 people. This corresponds with the MM4-5 classification.

It is my experience as a GP that rural residents do understand the tyranny of distance and of workload. They ask for comparable service to those available in the urban areas. If there is no intent to replace ED services in metro areas with virtual care, then why is it a rural option? Virtual care has huge value and ease for many health services. It is problematic in acute deteriorating patients and in those who require the laying on of hands. Rural Generalists and well trained and supported nursing staff who are paid and supported to maintain a wide breadth of practice can and should provide the backbone of rural emergency care.

An analysis of the planning systems and projections that are used by NSW Health in determining the provision of health services that are to be made available to meet the needs of residents living in rural, regional and remote NSW

I have not seen publicly available workforce or service planning that delineates rural need. There are for instance no publicly available face to face or operative Ear Nose and Throat services in NW NSW with a population catchment of 180 000 (this excludes an Aboriginal service). Workforce planning is an inexact science, however, there is good evidence that for the last few years we have been training many doctors for specialist practice in NSW, yet their distribution and specialty choices are not meeting population need.

Balance between generalist and specialism

Importantly the National Medical Workforce Strategy due to be reviewed by all jurisdictions this year will identify the importance in the health system of an increased emphasis on generalism. The reason for this is related to both quality and efficacy of care. The table below seeks to define the complementarity of skills required to optimally drive good health care. Again, changes including renumeration to better reflect and incentivise both these skill sets are required.

Table 2: The differences between the generalist and specialist clinical contexts and their contributions to health systems. Gerada, Riley and Simon April 2012 Enhanced GP Training: The Educational Case https://www.rcgp.org.uk/-/media/Files/Policy/A-Z-policy/Case_for_enhanced_GP_training.ashx?la=en

A generalist must develop the skills to	**A specialist must develop the skills to**
Tolerate uncertainty – generalists must manage a large proportion of patients with undifferentiated symptoms; including those who present early in the course of illness, those with evolving conditions, or those whose symptoms do not form a characteristic pattern of disease.	**Reduce uncertainty** – specialists are expected to discover a diagnosis and to investigate until this is achieved. If they are unable to identify a diagnosis within their own specialty, they are usually expected to discharge the patient or suggest referral on to another specialist, rather than manage the diagnostic uncertainty.
Explore probability - generalists see patients from an unscreened population with a relatively low incidence of disease. They require highly developed diagnostic skills, including recognition of common conditions and awareness of the limits of their knowledge. Their decisions are based on the epidemiology of the community and the consequent probability that the patient's symptoms are medically significant.	**Explore possibility** - specialists see a preselected population of patients with a relatively high incidence of serious disease. They require expert knowledge of the rare and esoteric conditions that are relatively more likely to be the cause of the problem in this population.
Marginalise danger – a key skill of a general practitioner is to recognise and act on potential dangers to patients even when there is diagnostic uncertainty; this often requires referring the patient or initiating treatment before a diagnosis has been established (e.g., in a case of suspected meningitis or cancer).	**Marginalise error** – a specialist must ensure that they reach an accurate diagnosis to guide treatment for the patient, in order to enable a successful outcome.

An analysis of the capital and recurrent health expenditure in rural, regional and remote NSW in comparison to population growth and relative to metropolitan NSW.

I am not qualified to answer this question.

An examination of the staffing challenges and allocations that exist in rural, regional and remote NSW hospitals and the current strategies and initiatives that NSW Health is undertaking to address them.

Whilst not privy to NSW Health budgeting arrangements it is my observation that the attitude must be to "investing" in health services and personnel. It is very challenging in a climate of scarce funding to be considerate of the "longer game".

There is urgent need to see systemic support to the breadth of practice required in rural communities. As previously mentioned, there are a number of structural concerns in the way the medical, nursing and allied health is being perceived, trained and deployed. Figure 1 shows the necessarily close alignment that is required between the Commonwealth, State, community and specialist colleges in order to support a rural workforce.

The advent of the Regional Training Hubs (under the auspices of the RHMT program) and their associated Rural Clinical School structure is an opportunity to better tie together rurally intended medical students with prevocational training in a rural area and supported entry into GP and specialist training options in regional centres. It is this "training in place" option that will likely improve retention although the benefits will take 10 - 15 years to accrue.
https://www1.health.gov.au/internet/main/publishing.nsf/Content/regional-training-hubs

Some of the shorter-term challenges in attracting and retaining GPs to rural centres include the poor viability of rural practice and the long hours. Additionally, "rural" is seen as a lesser career direction with poor recognition or support for extended practice scopes. Within "rural" there are a range of options. Unattractive locations are often noted where there is small population size, long distances to other towns and less hospitable climatic conditions. Coupled with often negative workplace cultures and high staff turnover, professional satisfaction can wane quickly with the challenge also of large amounts of on call and relatively unsupported practice. Finally, there are many personal factors such as partner employment or "cultural fit" that rural communities struggle to support and enhance.

In order to meet this challenge the previous Rural Health Commissioner, Paul Worley, has written a blue print document detailing the model of rural generalists: https://www1.health.gov.au/internet/main/publishing.nsf/Content/2922D6D8BBCE122FCA2581D30076D09A/$File/Advice-to-the-National-Rural-Health-Commissioner-on-the-Development-of-the-National-Rural-Generalist-Pathway.pdf

This model will go some way to redressing the balance but does not necessarily pick up all those who need to be involved. Career support to rural doctors working in Aboriginal Medical Services and those working in rural general practice (but not necessarily in rural emergency) will need to be considered.

Figure 1 below details the training route from RGs (rural generalists). The RG coordinating unit in NSW through HETI is starting to build this model and ensure the linking of options and mentoring of interested practitioners.

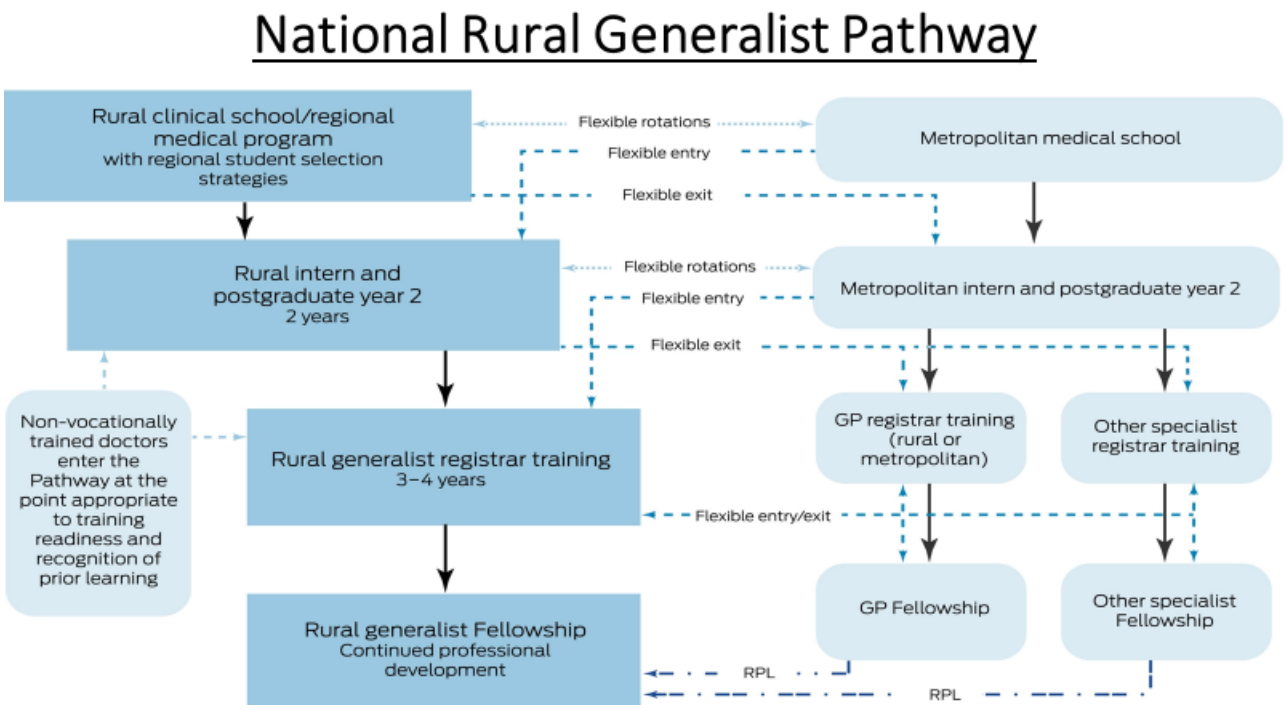


Figure 1 (Worley Rural Generalist discussion paper referenced above)

Figure 2 Rural Training and Key stakeholders (JMAY 2020)

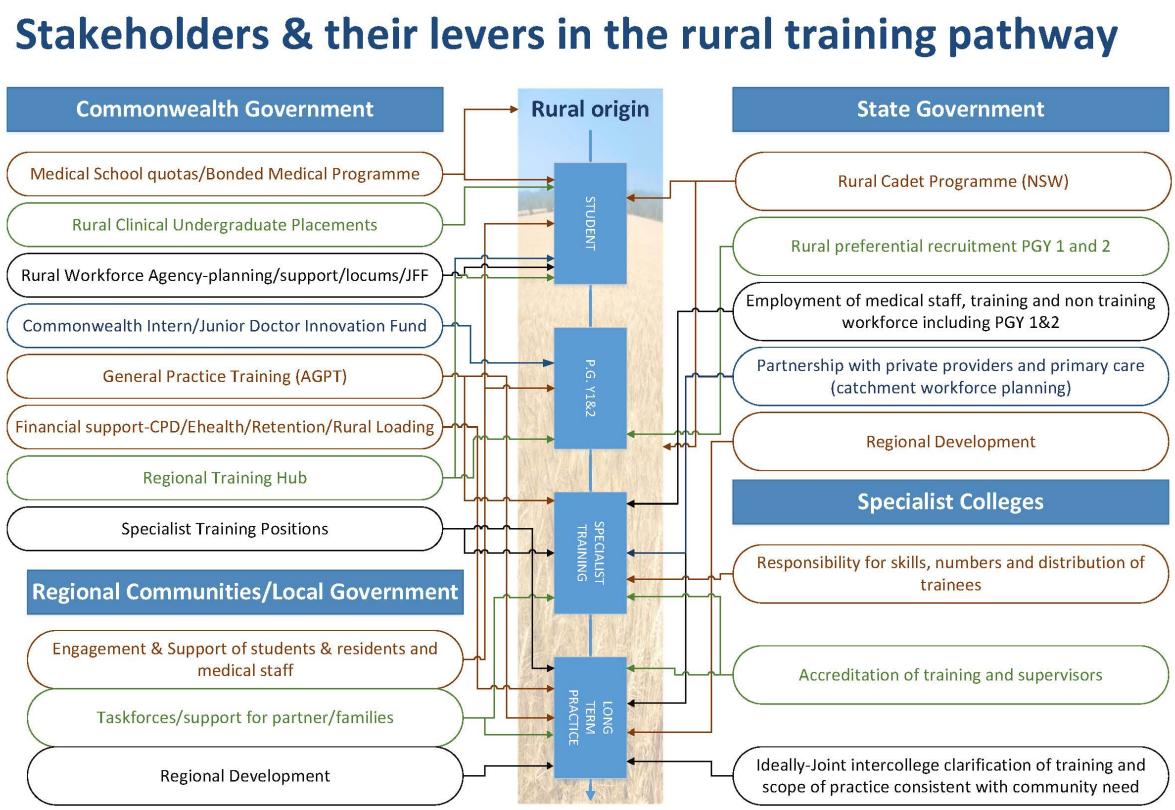


Figure 2 identifies many of the programmes and levers currently available within the rural training sphere. The need for multiple strategies that are synergistic and aligned is highlighted with no one strategy or stakeholder sufficient on its own.

The most recent evidence around Australian recruitment and retention factors comes from a recently published systematic review (20). It usefully summarises the current positive evidence in terms of rural training and identifies the synergistic effect of positive rural exposure and ongoing training. The extension of this training into post graduate specialist training will therefore almost certainly pay longer term dividends. They conclude that “GPs who completed rural rotations during postgraduate training were more likely to enter rural practice with the location of final year training particularly influential”. This was consistent with previous work demonstrating an association between likelihood of rural practice and duration of rural vocational training. They go onto summarise that “e most studies suggest that rural background is the most important predictor of later rural practice, many GPs do not have rural backgrounds and selection on this criterion can only be part of the solution for relieving the lack of GPs in rural areas. Longer rural placements at both the undergraduate and postgraduate medical levels may influence commitment to rural

practice. The final year of training may be particularly important for enhancing community integration and for essential clinical skills development, better preparing GPs for rural practice. Providing students and doctors with extended rural opportunities throughout training should be components of government strategies for solving rural workforce problems.

John Wakerman's systematic review in 2008 looked at the enablers of successful rural primary care models in smaller communities. It Illustrates the importance of partnerships and integrated funding sources. It also illustrates the importance of accommodation and infrastructure which are ongoing costs but allow easy entry/ gracious exit models (21).

Table 3: Environmental enablers and essential service requirements for the 'Easy entry-gracious exit' discrete model (Wakerman 2008 BMC Open)

Environmental enablers	
Supportive policy	Initial Commonwealth grant funds enabled provision of practice equipment & furnished doctor housing. Following this, the Rural Medical Infrastructure Fund supported the model.
Commonwealth/State relations	Commonwealth and State agencies negotiated contracts of service to cash out some services, enabling a reliable income stream which enabled more specific income estimates for prospective doctors
Community readiness	There was a strong community commitment to finding solutions to the GP recruitment problem and local champions to drive the change to community ownership of infrastructure.
Essential service requirements	
Workforce	Recruits from a larger pool due to limited infrastructure investment requirement. Expanded GP role provides additional positions so can provide self-cover for after hours and on-call work.
Funding	Cashing out of hospital Visiting Medical Officer services, population health activity, Extended Primary Care (EPC) items, other Medicare and Retention Grants fund bulk-billing service.
Governance, management & leadership	Community, agencies (e.g., Division of General Practice, Area Health Service, Rural Workforce Agency) represented on Board. Professional business management instituted.
Linkages	Provides a platform for integration. Strong community & other linkages as above. Enables EPC activity involving allied health team.
Infrastructure	Community ownership through Rural Medical Infrastructure Fund, local government, Practice Incentives Program, Area Health Services. Potential collocation with hospital or community services.

In summary there are two key concepts in considering rural workforce:

1. We need to train doctors that can work in both an urban and a rural area rather than train doctors to work *only* in a rural area. All doctors should be trained in generalist skills providing a larger pool of doctors to call upon, and also ensure that those who choose to practice rurally are not disadvantaged if their situation changes and they need to relocate to an urban area.

2. We need to rethink retention. No longer are we asking doctors to work in rural centres for all their working life. Many current practitioners look for work/life balance, the possibility of working part-time and are willing to explore opportunities and experiences in a number of different locations through their career. We should be expecting and hoping for the mobility we see in other parts of the workforce. Practitioners who come and work in rural areas for 2-5 years and can come in and out of a rural community should be the desired norm.

Finally, if the intent is to downgrade services and access for rural communities there must be a "ramping up" of retrieval services and "just in time care", and this trade-off must be clearly articulated to the community. Worsening long term health outcomes and the loss of opportunities to reduce risk factors will take many years to become evident and equally long to mitigate. In the short term, an increase in avoidable or preventable hospitalisations is likely to be the result. The lack of support to general practice and primary care and the import in rural communities to integrate care is a responsibility to be born equally by the Commonwealth and State governments who need to iron out some of the perverse funding anomalies that make rural general practice and care of rural communities both unattractive and poorly viable.

The access and availability of oncology treatment in rural, regional and remote NSW.

I have no accurate state-wide information for this.

The access and availability of palliative care and palliative care services in rural, regional and remote NSW.

As a provider of palliative care services in general practice, residential aged care and public and private hospitals, it remains a hugely important scope of practice that needs to be available with the laying on of hands, for rural Australians. I fear that we are not training practitioners with the confidence as well as the competence, nor the commitment to provide

an out of hours service. Training, support and renumeration will be required to a well distributed service that endures.

References

1. Australian Bureau of Statistics. 2016 Census Quickstats Canberra: ABS; 2019 [updated 12/07/2019. Available from: https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/110?opendocument).
2. Statistics ABo. The Australian Statistical Geography Standard (ASGS) Remoteness Structure Canberra: ABS; 2016 [updated 2016. Available from: https://www.abs.gov.au/websitedbs/D3310114.nsf/home/remoteness+structure.
3. Australian Bureau of Statistics. ABS. Cat.no. 2033.0.55.001. Socio-Economic Indexes for Areas (SEIFA), Australia, 2016 Canberra: ABS; 2018 [updated 27/03/2018 Available from: https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/2033.0.55.0012016?OpenDocument.
4. Hunter New England Local Health District. Hunter New England Local Health District: HNELHD; [Available from: http://www.hnehealth.nsw.gov.au/Pages/home.aspx.
5. National Rural Health Alliance. How many doctors are there in rural Australia? Canberra: NRHA; [Available from: https://www.ruralhealth.org.au/sites/default/files/publications/nrha-factsheet-doctor-numbers.pdf
6. Hunter New England Central Coast Primary Health Care Network HNECC PHN Health Planning Compass 2018 [Available from https://hneccphn.imgix.net/assets/src/uploads/resources/hnecc-health-planning-compass-2018.pdf
7. Cancer institute NSW. Breastscreen NSW Sydney: Cancer institute NSW; 2020 [Available from: https://www.breastscreen.nsw.gov.au/.
8. Australian Institute of Health and Welfare. CIMAR (Cancer Incidence and Mortality Across Regions) books: Statistical Area Level 3 (SA3), 2006–2010 Canberra: AIHW; 2016 [Available from: http://www.aihw.gov.au/cancer-data/CIMAR-books.
9. Australian Institute of Health and Welfare. Data tables: National cancer screening programs participation data supplementary tables. Participation in Australian cancer screening programs in 2015-2016 Canberra: AIHW; 2016 [Available from: https://www.aihw.gov.au/reports/cancer-screening/national-cancer-screening-programs-participation/data.
10. Cancer Institute NSW. Reporting for Better Cancer Outcomes Performance Report 2018. Hunter New England Local Health District. Sydney: Cancer Institute NSW 2019.

11. Nichols, M., et al., *Australian heart disease statistics 2015*. 2016: National Heart Foundation of Australia Melbourne.

12. Davies, A.J., et al., *Trends in the Incidence of First Acute Myocardial Infarction in Metropolitan and Regional Areas of the Hunter Region.* Heart, Lung and Circulation, 2019. **28**(4): p. e37-e39.

13. Davies, A.J., et al., *Disparities in the incidence of acute myocardial infarction: long-term trends from the Hunter region.* Internal medicine journal, 2017. **47**(5): p. 557-562.

14 Institute for Health Care Improvement . The IHI triple bottom line [Available from http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx

15 Modified Monash Model. Available online: http://www.doctorconnect.gov.au/internet/otd/publishing.nsf/Content/MMM_locator (Refre Modified Monash

16. Starfield, B., Shi, L., Macinko, J.. 2005. "*Contribution of Primary Care to Health Systems and Health*." Milbank Quarterly 83 (3): 457–502 14.

17. Barker I, Steventon A, and Deeny SR. '*Association between continuity of care in general practice and hospital admissions for ambulatory care sensitive conditions: Cross sectional study of routinely collected, person level data*.' BMJ (Clinical Research Ed), 356, j84, 2017.

18. Nagree Y, Camarda VJ, Fatovich DM, Cameron PA, Dey Iet al. '*Quantifying the proportion of general practice and low-acuity patients in the emergency department*, 'The Medical Journal of Australia, 198, 612-615, 2013.

19. May J. (PhD Thesis) *Rural and Urban-An Exploration of Medical Workforce in regional centres in Australia*. Melbourne: Monash University :2016

20. Ogden J, Preston S, Partanen RL, Ostini R, Coxeter P *Recruiting and retaining general practitioners in rural practice: systematic review and meta-analysis of rural pipeline effects* The Medical Journal of Australia, 21 Jul 2020, 213(5):228-236 DOI: 10.5694/mja2.50697

21. Wakerman, J., Humphreys, J.S., Wells, R. *et al. Primary health care delivery models in rural and remote Australia – a systematic review*. BMC Health Serv Res **8,** 276 (2008). https://doi.org/10.1186/1472-6963-8-276

Table 1 Workforce characteristics by MM (JMAY 2020)

	Specialist Medical Services provision	General Practice	Nursing	Allied Health	Type of Infrastructure	Type of Funding Model	Training opportunities
MM1 (Sydney, Newcastle, Wollongong Tweed Heads)	Public and private specialist services for inpatients and outpatients Sub-specialty and quaternary services	Discrete private General Practice with standalone general practice services such as skin cancer /MSK	Large range of generalist specialty and sub-specialty positions across the full breadth of nursing workforce	Private and corporate Allied health providers. Sub-specialists clinics public and private	Standalone discrete primary and secondary care services	Market based funding models- MBS funded general practice/Chronic care allied health/NDIS Self/PHI/State funding for hospital services (ABF)	Unlimited for all professions and specialties
MM2 Sometimes labelled large regional-no NSW centres	Public and private specialist services for inpatients and outpatients Some discrete Sub-specialty services	Discrete private General Practice with standalone general practice services such as skin cancer /MSK	Large range of generalist specialty and sub-specialty positions across the full breadth of nursing workforce	Private and corporate Allied health providers. Limited subspecialists clinics public and private	Standalone discrete primary and secondary care services	Market based funding models- MBS funded general practice/Chronic care allied health/NDIS Self/PHI/State funding for hospital services (ABF)	Training for most professions – with focus on clinical placements some models may be hub and spoke
MM3 Often Labelled regional Tamworth, Taree, Port Macquarie	Resident Specialists providing both generalist and sub specialist services inpatient and outpatient with 24/7 roster of 12 major specialties Limited options to access Private inpatient and outpatient services	Scope of practice includes pal care/nursing home /community settings +/- private hospital access	Specialist nursing positions available Limited post grad positions with RN/EN /AIN workforce	Limited Private Allied health providers Limited state health allied health service provision	Combination of discrete private primary and secondary services supplemented with state funded/NGO ACCHS models	MBS funded general practice Some specialist services and allied health services FFS models (ABF Hospital) supplemented with block funding where market failure	Training for most professions with focus on clinical placements– some models may be hub and spoke
MM4 Considered rural- Gunnedah, Glen Innes, Inverell	Generalist specialists and Rural Generalist GPs- share acute care roster-ObGyn/Anaes/Surg and hub and spoke Specialist access/FiFO	Rural Generalist (RG) Model with procedural capacity and 24/7 hospital roster/on call Co located or standalone primary care services (ACCHS) model	Specialist nursing positions available (i.e., midwifery) Limited post grad positions with RN/EN /AIN workforce	Scattered private practice Limited state health allied health service provision and hub and spoke models	Acute care beds and ED Co-located state-run allied health services	Block funded specialist services (FIFO or hub and spoke) GP VMO or salaried model with on call rosters for ED and procedural specialties Scattered private FFS Allied health with some block funded allied health services	Some training options usually allied to more metropolitan program EN/AIN training in place
MM5 Considered rural	Generalist physicians and surgeons with hub and spoke specialist access /FIFO	Acute care beds Co located or standalone primary care services (ACCHS)or MPS type model	Generalist RN nursing positions with EN/AIN workforce	Limited salaried state health allied health service provision and hub and spoke models	Acute care beds and ED Co located state run allied health services	Block funded specialist services (FIFO or hub and spoke) GP VMO or salaried model with on call rosters for ED and procedural specialties (Hospital non-ABF) Scattered private FFS Allied health with some block funded allied health services	Some training options usually allied to more metropolitan program EN/AIN training in place
MM6- considered remote	Hub and Spoke Fly in Fly out non acute with Telemedicine	Range of models- acute/subacute/outpost with primary care service	Generalist RN nursing positions with EN/AIN workforce	Salaried outreach services State owned and NGO	NGO /State owned infrastructure	Salaried models with MBS cash out/supplement	Clinical placements as part of hub and spoke training
MM7 Considered very remote	Hub and spoke Fly in fly out non acute services and telemedicine	Wide scope of primary health care services (Rural Generalist capability) without necessarily procedural care options	Remote area nurses with extended scope of practice	Salaried outreach services Sate owned and NGO	State owned infrastructure with fly in fly out service provision	Salaried models including for outreach services like RFDS	Clinical placements as part of hub and spoke training