A survey of adult respiratory and sleep services in Aotearoa New Zealand: inequities in the provision of adult respiratory and sleep services

Roland Meyer, Paul Dawkins, James Fingleton, Brett Shand, Elaine Yap on behalf of the Thoracic Society of Australia and New Zealand (TSANZ)

ABSTRACT

AIMS: The New Zealand “Standards for Adult Respiratory and Sleep Services” were published by the Ministry of Health in 2004. A 2006 survey demonstrated major gaps in the staffing and service provision and significant variation between district health boards (DHBs). We repeated this survey in 2019/20 in order to highlight issues which should be addressed as part of health service reforms.

METHODS: Survey of all adult DHB respiratory services assessing staffing and service provision.

RESULTS: There is marked regional variation in staffing levels for all specialist clinicians. There are 1.18 FTE/100,000 population respiratory physicians, which is well below Australian and United Kingdom levels. Two hundred thousand people in New Zealand do not have access to a local respiratory physician. For provided services we found a four-fold variation between DHBs for CPAP treatments, six-fold for oxygen services, and eight-fold for pulmonary rehabilitation.

CONCLUSION: The place of residence of New Zealanders determines access to respiratory services. There are inequities in access, with little progress made since 2006. Data on health outcomes are required. The restructure of the health service must rectify this situation. The need to end a “postcode lottery” is demonstrated when reviewing current respiratory services in New Zealand.

Standards for respiratory and sleep services in New Zealand were recognised and published on the Ministry of Health (MoH) website in 2004, where they have remained unchanged.

A survey of adult respiratory services completed in 2006 reported that over 400,000 New Zealanders had no access to a respiratory physician, and that only four of the six large district health boards (DHBs), four of the nine medium sized DHBs, and two of the six small DHBs complied with the Standards. A significant regional variation in the staffing levels of all respiratory clinicians was noted. Inequity of service provision was also apparent, such as a seven-fold variation between DHBs for prescriptions of oxygen therapy, and a five-fold variation for investigation and treatment of patients with sleep-related breathing disorders. The absence of national health targets for respiratory services was noted to be a significant deficiency and that the apparent lack of planning for respiratory services was of major concern.

We repeated this survey for the now 20 DHBs to assess changes since 2006 and to highlight issues which should be addressed as part of a health service reform in New Zealand. This reassessment provides a stocktake of adult respiratory services prior to the disestablishment of the DHBs and the creation of Te Whatu Ora – Health New Zealand. Planning of future respiratory and sleep services should be facilitated by the findings of this survey.

Methods

An updated version of the 2004 questionnaire was developed and approved by the New Zealand executive of the Thoracic Society of Australia and New Zealand (TSANZ). In late 2019, all DHBs with adult respiratory services were approached. The respiratory clinical directors of those DHBs were invited to complete the questionnaire (see Appendix 1). For those DHBs with no local respiratory services, the local general medical services lead, or neighbouring DHB responsible for the delivery of respiratory services there, were invited to complete the questionnaire.

The questionnaire sought information on:

- staffing levels;
- service provision— first specialist
assessments (FSA) and follow-up reviews and the DHB's ability to comply with the MOH's elective services performance indicator (ESPI 2);4
- diagnostic testing, and volumes of planned and acute services;
- community-based initiatives and specific strategies for chronic respiratory conditions;
- strategies for the Māori and Pasifika populations;
- collaboration between larger and smaller centers for management of respiratory conditions such as lung cancer and interstitial lung disease, conditions where multidisciplinary meeting (MDMs) are recommended as standard-of-care by international guidelines;
- oxygen, sleep, and pulmonary rehabilitation services;
- credentialling of respiratory physicians and respiratory departments;5
- accreditation of lung function and sleep laboratories.6

Statistical analysis
As the intention was a simple descriptive analysis, no formal hypothesis testing was performed. Results are reported as counts, proportions, or per 100,000 population as appropriate. DHBs were stratified by population size served: large sized DHB (population >300,000), medium sized DHB (100,000–300,000), and small sized DHB (<100,000).

Results
Of the 20 respiratory departments which received the survey, 16 responded with complete questionnaires. Two DHBs did not respond (Northland and Nelson-Marlborough), whilst two DHBs without on-site specialty respiratory services (Whanganui and West Coast) had some of their information provided by the MidCentral and Canterbury DHBs, respectively. The final analysis was therefore based on 18 DHBs consisting of seven large, six medium, and five small sized DHBs.

Staffing and workforce (Table 1)
Staffing levels across all professional groups have increased significantly since 2006, in terms of total full-time equivalents (FTEs) and FTEs per population but important differences remain between DHBs across all staff.

Specialist respiratory physicians
There remain no local specialist respiratory physicians in Whanganui, South Canterbury, Wairarapa, and West Coast DHBs, which serve a combined population of >200,000 people. Patients from these DHBs are managed by general medical services or they travel to attend specialist respiratory services in neighbouring DHBs. In those 14 DHBs with local respiratory physicians, the number of FTE varied three-fold: 0.73 to 2.26 per 100,000 population. Nine of the 13 designated DHBs' respiratory services had undergone external credentialling for the on-site physicians and the overall service.5

Respiratory nurses
Respiratory nurses included in this survey are respiratory nurse practitioners, nurse specialists providing inpatient and outpatient services, and respiratory ward nurses where a dedicated respiratory ward exists. There was large variation between DHBs in the combined number of respiratory clinical nurse specialists and nurse practitioners (0.44–2.38/100,000) and respiratory registered nurses (0–5.7/100,000). All but two DHBs reported to have some nurse-led services and some also provide community-based respiratory nurse clinics.

Respiratory physiotherapists
Respiratory physiotherapists provide a range of inpatient and outpatient services including pulmonary rehabilitation, treatment for airways diseases and disordered breathing patterns.5 Of the 18 DHBs, 10 employ respiratory physiotherapists, the others including three large DHBs rely on “generalist” physiotherapists.

Sleep physiologists/dedicated sleep nurses
The provision of sleep services varies across the country: only six DHBs have a sleep laboratory for overnight testing and treatment, others only offer portable (home) sleep testing and outpatient-based treatment. Several DHBs work in partnership with their neighbouring DHB or private sleep laboratories. Dedicated sleep service nursing staff may be involved in the provision of positive airway pressure (PAP) treatment. Different service models influence staffing levels (shown in Table 3). Amongst DHBs which provide “in-house” services there was a six-fold difference in the number of sleep practitioners (range, 0.6–2.65/100,000) and higher numbers for those with a sleep laboratory.
Respiratory physiologists

For DHBs with respiratory physiology laboratories there is a three-fold variation among specialist staff which is reflected in the range or complexity of tests provided.

Service provision (Tables 2 and 3)

Outpatient/planned services

All DHBs provide outpatient services at urban hospital facilities, while at least nine DHBs also provide outpatient clinics at peripheral hospitals and health facilities (Table 3). Three DHBs provide some visiting specialist clinics in a neighbouring DHB. In the smaller DHBs most respiratory patients are seen by the general medical physicians whilst more complex patients are reviewed by visiting specialists or at neighbouring DHBs.

According to the MoH elective services performance indicator (ESPI2) all patients referred and accepted for a FSA should be seen within four months. Two DHBs reported “always” meeting the ESPI2, seven reported this to be “usually”, four “sometimes”, and two “rarely”. For follow-up appointments, in five DHBs this is “usually” possible, in seven only “sometimes” and three “rarely”.

Seven services have dedicated services for Māori patients/whanau and three for Pasifika patients. Six are involved in a partnership with community or primary care providers including kaupapa Māori health services, marae-based clinics, or community-based respiratory assessments.

Acute services

In general, there are no models of care for patients needing admission with respiratory conditions. Their care is either provided by inpatient respiratory teams or general medical (GM) teams. Of the 18 DHBs, six provide acute inpatient respiratory services (five large DHB and one medium DHB), whereas the remaining 12 provide acute respiratory care together with general medical teams. Some DHBs have mixed models where respiratory physicians partake in their GM acute roster.

All services provide non-invasive ventilation (NIV) for the management of acute type 2 respiratory failure. This treatment is provided in a variety of clinical settings. A respiratory physician leads this service in 7 of 16 DHBs.

Sleep services

There is significant variation in the sleep service provision between DHBs (Table 3). Six have a dedicated sleep laboratory with overnight testing. Nine access sleep services from a neighbouring DHB or in partnership with a private provider. Three offer community-based sleep assessments. One DHB-based sleep service and one private organisation providing DHB services have undergone Australasian Sleep Association accreditation. There is almost four-fold variation in the total number of sleep studies completed (192–724/100,000 population). Polysomnography studies make up between 5% and 55% of all studies with different types of partial or portable studies making up the rest. The provision of CPAP treatment for obstructive sleep apnoea varies four point eight-fold between DHBs (92–441/100,000 population).

Diagnostic and interventional bronchoscopy services

Fifteen DHBs provide on-site bronchoscopy, while three DHBs rely on neighbouring DHBs. Endoscopic bronchial ultrasound (EBUS) and biopsy is only available in six DHBs. There is only one EBUS provider for the entire South Island.

Two North Island DHBs provide interventional bronchoscopy for large airway pathology including: rigid bronchoscopy, laser, argon plasma coagulation, cryotherapy and airway stenting, and also endobronchial valve for bronchopleural fistulae management. One DHB is developing a national service for bronchoscopic lung volume reduction using endobronchial valves.

Bronchoalveolar lavage (BAL) and transbronchial lung cryobiopsy (TBLC) have emerged as new diagnostic techniques for investigation of interstitial lung diseases.

Pleural ultrasound

All DHBs use bedside pleural ultrasound to investigate and manage pleural effusions in accordance with the 2017 TSANZ position statement. In six of 16 responding services none of the clinicians had undergone the process to achieve TSANZ competency for this procedure.

Respiratory physiology testing and respiratory laboratories

All DHBs provide on-site spirometry, and all but one provide lung volume testing and measurement of diffusion capacity (DLCO). Exhaled nitric oxide testing is undertaken by 10 DHBs, while 12 DHBs provide respiratory provocation testing. Both modalities are key investigations for patients...
Table 1: Comparison of respiratory staffing levels per 100,000 population in New Zealand DHBs between the 2006 and 2019 surveys.

<table>
<thead>
<tr>
<th>DHB</th>
<th>DHB population</th>
<th>Specialist respiratory physicians</th>
<th>Nurse practitioners + clinical nurse specialists/registered nurses</th>
<th>Respiratory physiotherapists</th>
<th>Sleep physiologists/dedicated sleep nurses</th>
<th>Respiratory scientists &amp; physiologists</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Large sized DHB &gt;300,000 population</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Waitematā</td>
<td>629 [480]</td>
<td>0.85 [0.65]</td>
<td>0.51/0 [0]</td>
<td>0</td>
<td>*</td>
<td>0.57 [0]</td>
</tr>
<tr>
<td>Canterbury</td>
<td>568 [530]</td>
<td>1.63 [1.25]</td>
<td>1.53/5.83 [1.6]</td>
<td>0.53</td>
<td>1.61 [0.4]</td>
<td>1.32 [1.0]</td>
</tr>
<tr>
<td>Counties Manukau</td>
<td>563 [430]</td>
<td>1.54 [1.15]</td>
<td>1.74/0 [1.1]</td>
<td>0.89</td>
<td>0.4</td>
<td>0.53 [0.3]</td>
</tr>
<tr>
<td>Auckland</td>
<td>546 [425]</td>
<td>1.57 [1.4]</td>
<td>1.13/5.68 [0.9]</td>
<td>0.37</td>
<td>1.67 [0.95]</td>
<td>1.0 [0.75]</td>
</tr>
<tr>
<td>Waikato</td>
<td>420 [390]</td>
<td>2.26 [0.66]</td>
<td>2.38/0.48 [0.75]</td>
<td>0.24</td>
<td>1.43 [0.6]</td>
<td>0.95 [0.55]</td>
</tr>
<tr>
<td>Southern</td>
<td>330 [276]</td>
<td>1.09 [0.9]</td>
<td>0.73/0.97 [1.2]</td>
<td>0</td>
<td>1.48 [0.7]</td>
<td>0.97 [0.65]</td>
</tr>
<tr>
<td>Capital Coast</td>
<td>318 [250]</td>
<td>1.41 [0.95]</td>
<td>0.44/0.34 [0.8]</td>
<td>0</td>
<td>*</td>
<td>1.82 [1.8]</td>
</tr>
<tr>
<td><strong>Medium sized DHB 100,000–300,000 population</strong></td>
<td></td>
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<tr>
<td>Bay of Plenty</td>
<td>238 [190]</td>
<td>1.68 [1.0]</td>
<td>1.55/1.13 [1.0]</td>
<td>0.21</td>
<td>0.84 [1.0]</td>
<td>0.76 [0.5]</td>
</tr>
<tr>
<td>MidCentral</td>
<td>179 [170]</td>
<td>1.45 [0.75]</td>
<td>1.95/0.73 [1.8]</td>
<td>0.73</td>
<td>1.67</td>
<td>1.4 [1.3]</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>166 [150]</td>
<td>1.26 [1.3]</td>
<td>1.81/0.72 [0.66]</td>
<td>0.24</td>
<td>0.6 [1.8]</td>
<td>1.08 [1.3]</td>
</tr>
<tr>
<td>Hutt Valley</td>
<td>150 [130]</td>
<td>0.73 [0.55]</td>
<td>0.93/0 [1.7]</td>
<td>0.6</td>
<td>*</td>
<td>1.27 [0.55]</td>
</tr>
<tr>
<td>Taranaki</td>
<td>120 [100]</td>
<td>0.83 [0.5]</td>
<td>0.83/0 [2.2]</td>
<td>0.83</td>
<td>*</td>
<td>0.83 [0]</td>
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<tr>
<td>Lakes</td>
<td>110 [103]</td>
<td>1.90 [0.4]</td>
<td>1.91/0 [1.1]</td>
<td>0</td>
<td>1.45 [0]</td>
<td>ND [0]</td>
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<tr>
<td><strong>Small sized DHB &lt;100,000 population</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whanganui</td>
<td>65 [64]</td>
<td>0 [0]</td>
<td>ND [1.5]</td>
<td>0</td>
<td>*</td>
<td>0 [0]</td>
</tr>
<tr>
<td>South Canterbury</td>
<td>60 [54]</td>
<td>0 [0]</td>
<td>1.25/0 [2.5]</td>
<td>0</td>
<td>0.83 [0]</td>
<td>0 [0.5]</td>
</tr>
<tr>
<td>Tairāwhiti</td>
<td>49 [44]</td>
<td>1.0 [2.0]</td>
<td>1.22/0 [1.0]</td>
<td>0.4</td>
<td>2.60 [0]</td>
<td>1.0 [0]</td>
</tr>
<tr>
<td>Wairarapa</td>
<td>45 [39]</td>
<td>0 [0]</td>
<td>2.22/0 [2.0]</td>
<td>0</td>
<td>*</td>
<td>0 [0]</td>
</tr>
<tr>
<td>West Coast</td>
<td>32 [31]</td>
<td>0 [0]</td>
<td>ND [3.0]</td>
<td>0</td>
<td>*</td>
<td>0 [0]</td>
</tr>
</tbody>
</table>

All data represent the number of staff per 100,000 population.
No data for Northland and Nelson Marlborough.
ND = No data provided.
*Sleep services provided by other DHB or private organisation.
The 2006 data are shown in square brackets [ ]. In 2006, Southern DHB included the separate Otago and Southland DHBs.
Table 2: Respiratory and related services provided by the different DHBs, grouped by population.

<table>
<thead>
<tr>
<th>DHB</th>
<th>Dedicated respiratory service</th>
<th>Sleep lab (PSG)</th>
<th>Referral specialities within DHB</th>
<th>Allergy/immunology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adult</td>
<td>Adult acute</td>
<td>Paediatric</td>
<td>CF clinic</td>
</tr>
<tr>
<td>Waitematā</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Canterbury</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Counties</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Auckland</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Waikato</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Southern</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Capital Coast</td>
<td>Y</td>
<td>Y</td>
<td>Y*</td>
<td>Y</td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>Y</td>
<td></td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Mid Central</td>
<td>Y</td>
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<td></td>
<td>Y</td>
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<td>Northland</td>
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<tr>
<td>Hawkes Bay</td>
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<td>Nelson-Marlborough</td>
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<tr>
<td>Lakes</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whanganui</td>
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</table>
Table 2 (continued): Respiratory and related services provided by the different DHBs, grouped by population.

<table>
<thead>
<tr>
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</thead>
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<tr>
<td></td>
<td>Adult</td>
<td>Adult acute</td>
<td>Paediatric</td>
<td>CF clinic</td>
</tr>
<tr>
<td>South Canterbury</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tairāwhiti</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wairarapa</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Coast</td>
<td>Y</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Abbreviations: Y = yes; PSG = polysomnography; CF = cystic fibrosis; ILD = interstitial lung disease; MDM = multi-disciplinary meeting. ^Outsourced through University of Otago.

Table 3: Inpatient and outpatient services provided by DHBs per population.

<table>
<thead>
<tr>
<th>DHB</th>
<th>DHB population (000)</th>
<th>Acute respiratory admissions</th>
<th>FSA</th>
<th>Follow-up</th>
<th>Sleep studies all types (%PSG)</th>
<th>CPAP new patients</th>
<th>NIV #</th>
<th>Pulmonary rehabilitation</th>
<th>Home oxygen</th>
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<tbody>
<tr>
<td>Large sized DHB &gt;300,000 population</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Waitematā</td>
<td>629</td>
<td>GM</td>
<td>424</td>
<td>418</td>
<td>0*</td>
<td>0*</td>
<td>12</td>
<td>19</td>
<td>22</td>
</tr>
<tr>
<td>Canterbury</td>
<td>568</td>
<td>221</td>
<td>753</td>
<td>1367</td>
<td>433+284C (11.5%)</td>
<td>161</td>
<td>52</td>
<td>53</td>
<td>40</td>
</tr>
<tr>
<td>Counties Manukau</td>
<td>563</td>
<td>249</td>
<td>458</td>
<td>919</td>
<td>311* (17.1%)</td>
<td>92*</td>
<td>26</td>
<td>41</td>
<td>40</td>
</tr>
<tr>
<td>Auckland</td>
<td>546</td>
<td>380</td>
<td>432</td>
<td>1,282</td>
<td>293* (54.5%)</td>
<td>179*</td>
<td>28</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Waikato</td>
<td>420</td>
<td>460</td>
<td>355</td>
<td>641</td>
<td>649 (18.3%)</td>
<td>190</td>
<td>56</td>
<td>14</td>
<td>29</td>
</tr>
<tr>
<td>Southern</td>
<td>330</td>
<td>225</td>
<td>347</td>
<td>648</td>
<td>194 (4.7%)</td>
<td>136</td>
<td>33</td>
<td>15</td>
<td>48</td>
</tr>
<tr>
<td>Capital Coast</td>
<td>318</td>
<td>GM</td>
<td>394</td>
<td>698*</td>
<td>236* (36.0%)</td>
<td>125*</td>
<td>40</td>
<td>36</td>
<td>25</td>
</tr>
</tbody>
</table>
### Table 3 (column): Inpatient and outpatient services provided by DHBs per population.

<table>
<thead>
<tr>
<th>DHB</th>
<th>DHB population (000)</th>
<th>Acute respiratory admissions</th>
<th>FSA</th>
<th>Follow-up</th>
<th>Sleep studies all types (%PSG)</th>
<th>CPAP new patients</th>
<th>NIV #</th>
<th>Pulmonary rehabilitation</th>
<th>Home oxygen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medium sized DHB 100,000–300,000 population</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>238</td>
<td>GM</td>
<td>365</td>
<td>344</td>
<td>331 (4.8%)</td>
<td>181</td>
<td>24</td>
<td>61</td>
<td>72</td>
</tr>
<tr>
<td>Mid Central</td>
<td>179</td>
<td>208</td>
<td>217</td>
<td>323</td>
<td>158+352C (7.1%)</td>
<td>357</td>
<td>33</td>
<td>33</td>
<td>28</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>166</td>
<td>GM</td>
<td>401</td>
<td>639</td>
<td>724 (0)</td>
<td>210</td>
<td>43</td>
<td>151</td>
<td>51</td>
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<tr>
<td>Hutt Valley</td>
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<td>GM</td>
<td>582</td>
<td>888</td>
<td>0*</td>
<td>0*</td>
<td>60</td>
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<td>327</td>
<td>617</td>
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<td>5</td>
<td>37</td>
<td>57</td>
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<tr>
<td>Lakes</td>
<td>110</td>
<td>GM</td>
<td>598</td>
<td>1,868</td>
<td>269 (0)</td>
<td>441</td>
<td>55</td>
<td>23</td>
<td>108</td>
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<td><strong>Small sized DHB &lt;100,000 population</strong></td>
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<td>Whanganui</td>
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<tr>
<td>South Canterbury</td>
<td>60</td>
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<td>192C</td>
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<td>Tairāwhiti</td>
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<td>GM</td>
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<td>West Coast</td>
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<td>350C</td>
<td></td>
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<td>56</td>
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</table>

All data represents the annual number per 100,000 population. Empty fields are due to lack of data.

Pulmonary rehabilitation patient numbers are total referrals and patients completing a programme (75% attendance) per 100,000 population.

Home oxygen patient numbers are totals on oxygen concentrator treatment and patients also on cylinder oxygen (for ambulatory or emergency use).

The survey did not establish wait times, patient volumes including inter-district flows.

Admissions numbers shown are under care of a dedicated Respiratory service. GM = Generalist admission model i.e., acute admission under General Medical services.

Outpatient activity includes senior medical officers/registered medical officers/nurse practitioners/clinical nurse specialists where these are available.

Community sleep assessments including a level 4 study (only for Canterbury, Mid Central, South Canterbury, West Coast DHBs).

Community sleep assessments including a level 4 study (only for Canterbury, Mid Central, South Canterbury, West Coast DHBs).

* Auckland DHB provides sleep services for Waitemata. WellSleep/Capital Coast DHB provides sleep services for Hutt Valley and Wairarapa DHBs, and Eden Sleep provides sleep services for Taranaki.

# Data from Neill et al.\(^2\)

Further Abbreviations: FSA = first specialist assessment; CPAP = continuous positive airway pressure; NIV = non-invasive ventilation; PSG = polysomnography.
with possible airways disease. Six DHBs provide simulated altitude assessments for patients with hypoxaemia, while eight offer cardiopulmonary exercise testing (CPET).

Only four of the respiratory physiology laboratories had achieved TSANZ accreditation when completing this survey in 2019, compared with 2006 when it was six. The number of trained respiratory physiology staff, standardised for the population, shows a more than three-fold variation between DHBs.

Pulmonary rehabilitation

All 16 DHB services included in the survey provide pulmonary rehabilitation although the rates of referral and completion vary considerably between DHBs, with a 10-fold difference in referrals (23–271/100,000 population) and in completion rates (15–151/100,000) (Table 3). Several DHBs are involved in community-based programmes in different locations. All services but one accept direct referrals from GPs.

Oxygen services

All DHBs provide an oxygen service (Table 3). The provision of long-term oxygen therapy (LTOT) ranged six-fold from 18 to 108 patients per 100,000 population, and the rate of prescriptions for cylinders or portable oxygen differed 16-fold (3–49/100,000). Between 4% and 67% of all oxygen patients were provided with portable oxygen in addition to concentrators, but the reasons for this difference were not studied specifically. In three services there was no routine annual review of oxygen patients.

Services for specific respiratory diseases

Cancer services

In line with the New Zealand Lung cancer standards, the set-up of cancer services has changed considerably since the 2006 review. The major development is the availability of regional multi-disciplinary cancer panel meetings (MDM) where all suspected or confirmed cancer cases are reviewed weekly. Regional meetings are facilitated by vast improvements in internet technology that allow video-conferencing and easy exchange of medical imaging. Most DHBs have appointed cancer coordinator nurses in recent years. Cases from smaller DHBs are discussed at a larger centre weekly MDM. The extra impact on resources in these larger centres hosting these MDMs has not been studied specifically. National Quality Performance Indicators (QPIs) and Faster Cancer Treatment (FCT) indicators are used. This predated the creation of Te Aho O Te Kahu—the New Zealand Cancer Control Agency in 2019.

Five DHBs provide thoracic surgical services and seven centres provide on-site radiotherapy for patients with a thoracic malignancy. Medical oncology services are provided in all locations with some chemotherapy provided in peripheral and even rural hospitals.

Interstitial lung disease

Similar to lung cancer, patients with ILD benefit from a MDM approach, whereby cases are discussed following initial diagnostics such as computed tomography (CT) and pulmonary physiology testing. Antifibrotic therapy for idiopathic pulmonary fibrosis (IPF) should be prescribed only after an MDM review. Six of the larger DHBs hold regular ILD MDMs and accept cases from neighbouring DHBs for discussion. Five of the smaller DHBs without “usually” and three “sometimes” refer patients to neighbouring ILD MDMs.

Tuberculosis

Of the 16 DHBs, six did not provide induced sputum testing for patients with suspected tuberculosis, presumably relying instead on bronchoscopic sampling which is not in line with the 2019 New Zealand tuberculosis guidelines.

Cystic fibrosis

Of the 16 DHBs, seven provide on-site cystic fibrosis clinics, with all accepting patients from neighbouring DHBs. Half of the DHBs without on-site CF clinics “usually” refer their cystic fibrosis patients while the other half “always” refer these patients.

Pulmonary artery hypertension

Six of the 16 DHBs provide on-site pulmonary artery hypertension clinics and most accept patients from other centres. Patients from centres without these services have variable rates of referral, with the responses ranging from “rarely” to “always”.

Lung transplantation

There is only one national lung transplantation service. This serves patients from throughout New Zealand and is based at Auckland City Hospital.
Discussion

This survey focused on staffing levels and the provision of adult respiratory services in the different New Zealand DHBs and assessed changes since a previous survey completed in 2006. The authors of the 2006 survey concluded that there was marked variation, a lack of monitoring of the DHBs’ performance and of health outcomes. There was no consistent planning of services and there seemed to be no accountability to implement the Respiratory Standards published in 2004. Suggested measures were not taken up and data on health outcomes and regional variation remain very limited now, more than one decade later.

Since 2006 there has been an increase in all respiratory clinicians providing an expanded range of respiratory and sleep services to the New Zealand population, but the size of the workforce lags behind international standards. We found a marked variation in respiratory specialists, nurses, physiotherapists, and physiologists between DHBs standardised per 100,000 population. The increase in full-time equivalent (FTE) respiratory physicians from 0.67/100,000 in 2006 to now, 1.18/100,000, still represents only 56% of that in the United Kingdom (2.1/100,000 range 1.3–3.3), 17 and 62% of that in Australia (1.9/100,000). Only DHB appointments are included here but not university FTE. Four of the smaller DHBs (two in each North and South Island) serving a combined population of 202,000 in 2019/20 remained without dedicated respiratory specialists and have limited nurse specialists. Respiratory Nurse Specialist and Nurse Practitioner rates varied more than five-fold between DHBs. Differences in the local care models may be part of the reason but different levels of commitment and investment into staff development and career progression are also likely to be important factors. Within New Zealand, there are different service models for the provision of acute respiratory services: generalist or respiratory speciality, or “mixed” services. This is reflected in the different numbers of acute specialist service admissions and will be a factor in the different staffing levels.

Patient outcomes for certain acute respiratory conditions are superior when care is provided by a dedicated specialist team, but only six of the 18 DHBs have those teams. Outpatient and community outreach services are similarly affected. Patient care may be compromised by the existing model-of-care where patients of a small DHB are reliant on the specialist service provided by a neighbouring DHB. Even within larger DHBs with a significant rural population (e.g., 45% in the Southern region and 41% in Waikato) the distance to the nearest hospital facility will be a barrier when accessing specialist services.

This survey provides evidence of marked variations in terms of the provision of specific respiratory and sleep services. Long-term oxygen therapy (LTOT) increases survival and improves the quality-of-life of hypoxic patients with chronic obstructive pulmonary disease (COPD) but per population there is a six-fold difference in the provision of home oxygen, more or less unchanged since 2006. Pulmonary rehabilitation improves symptom control and quality-of-life and decreases hospitalisations in patients with long-term respiratory disease, but there is a 10-fold difference in the referral and completion rates. There is a four-fold variation in the numbers of sleep studies and in the CPAP provision for patients with obstructive sleep apnoea (OSA). Even DHBs with the highest rates of CPAP trials are likely to underserve their population. Our data confirm previous reports of an inequitable service provision of sleep services in New Zealand: Neill et al. showed an almost 16-fold variation in the provision of home NIV for patients with ventilatory insufficiency. Kelly et al. showed inconsistencies in the provision of equipment and consumables, and in patient follow-up. Acknowledging that a four-month wait time for referrals triaged to be “non-urgent” is deemed to be acceptable, four several DHBs reported difficulties booking first specialist assessments and follow-up reviews with patients facing significant delays.

From a diagnostics perspective, EBUS, a key diagnostic and staging tool in lung cancer, is only available in a single centre in the South Island. At least seven DHBs have no availability of bronchial provocation or exhaled nitric oxide testing, both key investigations for diagnosing airways disease. Lung cancer and airways disease represent the “bread and butter” of respiratory medicine, therefore the lack of adequate diagnostics compromises the care of many respiratory patients.

In cancer services, Quality Performance Indicators (QPI) provide some information about possible delays in the management and also about actual outcomes for patients referred for services. Without such indicators it is very difficult to develop and assess improvement strategies. The authors of the 2006 study called for similar indicators for respiratory services and conditions but this never eventuated. As a consequence, little...
has changed now 14 years later.

The creation of MDMs for lung cancer and ILD where most cases are discussed are first steps towards ensuring greater equity of respiratory care across the nation, using a “hub and spoke” model. However, the impact on the resources of those services “hosting” MDMs has not been evaluated.

Respiratory disease affects one in six people, is responsible for one in eight hospital admissions, and it is the third leading cause of death in New Zealand. Māori and Pasifika peoples are more affected and also carry a higher load of comorbidity. Inequitable health outcomes remain pervasive in New Zealand including for those with respiratory conditions. Our survey indicates there is an urgent need for better integration of all respiratory services within and between districts and also between rural and urban centres. A proper evaluation of patient outcomes and service performance will be key. There is little information on services provided at the community or primary care level, or those for Māori or Pasifika peoples. The impact of the COVID-19 pandemic was not studied as the survey was completed just before the New Zealand health system was affected, but it is likely to have been significant.

The major reform and restructure of the New Zealand health and disability services aimed to remove duplications in the health system, by replacing 20 DHBs with one single entity, Te Whatu Ora – Health New Zealand, alongside Te Aka Whai Ora – Māori Health Authority. The reforms were considered to have provided a real opportunity to address longstanding inequities, improve access to health services, correct the geographic variation that had characterised previous approaches, and to have ensured services in accordance with the principles of Te Tiriti O Waitangi. Key services such as respiratory services must be involved from the beginning and the learnings from the past must be included in this work.

In conclusion, the 2019/20 survey shows that despite significant advances in particular respiratory interventions, the degree of variation and inequity has not improved since a survey 14 years earlier. Performance and outcomes have not been measured adequately. It is therefore imperative that respiratory clinicians are included in nationally co-ordinated planning of future integrated and equitable services. The current COVID-19 pandemic highlights the importance of adequate, efficient and accessible respiratory services for all New Zealanders, wherever they live and whichever ethnic group they belong to. Without this input, respiratory services will not meet the increasing and complex demands on healthcare delivery, patients will be missing out, geographic and ethnic inequalities will persist, and the “postcode lottery” will not end.
COMPETING INTERESTS
Roland Meyer, Paul Dawkins, James Fingleton and Elaine Yap are members of the Executive of the New Zealand branch of the Thoracic Society of Australia and New Zealand, James Fingleton its President, and Elaine Yap its Past-President. The authors declare no conflicts of interest.

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Appendix 1: DHB Respiratory and Sleep Services Questionnaire. (Reproduced as supplementary material to this publication.)

Part 1. General information

1. Which district health board do you work in?
2. Who is the clinical lead responsible for adult respiratory and adult sleep services in the DHB you work with? Please provide name, role and speciality below.
3. Are there any respiratory disorders included in your DHB list of health priorities?
   • Yes
   • No
4. Does your DHB provide adult respiratory services from more than one hospital site?
   • Yes
   • No
   • If Yes, please list hospital sites here:
5. Please provide details of the number of FTEs in your DHB dedicated to audit respiratory services for the following personnel. Please enter your answer in tenths as a whole number i.e., 0.8FTE would be 8 tenths = enter 8.
   • Respiratory Physician
   • Sleep Physician
   • Respiratory Nurse Practitioner
   • Respiratory Nurse Specialist
   • Respiratory Nurse
   • Physiotherapist
   • Occupational Therapist
   • Smoking Cessation Practitioners
   • Respiratory Physiologist
   • Community Health Worker
   • Social Worker
   • Sleep Physiologist/Dedicated Sleep Nurse
   • Health Psychologist
   • Thoracic Surgeon
   • Radiologist respiratory imaging
   • Registrars
   • Advanced Trainees
   • Other
6. Does your DHB have a dedicated adult respiratory specialist service?
   • Yes
   • No
7. Does your DHB have a dedicated paediatric respiratory specialist service?
   • Yes
   • No
8. Does your DHB have a dedicated adult acute respiratory specialist service?
   Yes
   No
9. Does the general medical service also provide inpatient care for patients with acute respiratory illness?
   • Yes
   • No
10. Does the general medicine service provide acute cover for adult respiratory admissions out of hours?
   • Yes
   • No
11. What is the number of acute respiratory admissions under general medicine per year?
12. Does your DHB provide elective respiratory outpatient clinics?
   • Yes
   • No
13. What is the number of respiratory First Specialist Assessments (FSA) delivered per year?
14. What is the number of respiratory Follow Ups (FU) delivered per year?
15. Does your service use Respiratory Nurse Practitioner (NP) or Clinical Nurse Specialist (CNS) to deliver FSAs?
   • Yes
   • No
16. Does your DHB provide respiratory outpatient clinics on more than one site?

- Yes
- No
- If Yes, please list sites

17. Does your DHB provide any respiratory nurse led services?

- Yes
- No

18. Does your nurse led service provide any of the following services?

- OPD
- Asthma
- Bronchiectasis
- Interstitial Lung Disease
- Cystic Fibrosis
- Other (please specify)

19. Who within your DHB provides community based respiratory clinics?

- Physician
- Respiratory NP
- Respiratory CNS
- Specialty RN
- Other (please specify)

Part 2. Diagnostic procedures

20. Please indicate which of the following diagnostic tests are available within your DHB:

- CTPA/HRCT
- Isotope Nuclear Medicine Scan
- PET Scan
- CT Guided Lung Biopsy
- CT or US pleural Biopsy
- Bronchial Artery Embolisation
- Bronchoscopy
- Bronchoscopic blind TBNA
- EBUS
- Bronchoscopic Transbronchial Lung Biopsy TBB
- Cryo Biopsy
- BAL for ILD
- Laser
- Large Airway Stenting
- Bronchial Valve Insertion for management of brochopleural fistula
- Bronchial Valve Insertion for bronchoscopic lung volume reduction
- Medical Thorascopy
- Surgical Thorascopy
- Bedside Ultrasound for Pleural Procedures
- Cardiopulmonary Exercise testing
- Right Heart Catheterisation
- Lung Fuction Testing Including Lung Volume/DLCO
- Respiratory provocation testing
- Forced oscillation technique or other advanced lung fuction testing
- Exhaled Nitric Oxide
- Simulated altitude testing
- Induced Sputum for Tuberculosis
- Induced Sputum for Asthma

21. If your service does not provide EBUS, which district health board do you refer patients to?

22. Please indicate which of the following services are available within your DHB:

- Radiation Oncology
- Medical Oncology
- Thoracic Oncology
- Cardiology
- Allergologist/Immunologist
- Rheumatologist

23. Does your DHB provide training and credentialising in pleural ultrasound?

- Yes
- No

24. How many doctors have undergone TSANZ certification for pleural ultrasound? Provide your answer as a number e.g., 8.

25. Does your service triage bronchoscopy referrals?

- Yes
- No
- If Yes, do you have wait time targets and do you meet those targets? Please comment

26. Does your DHB have any specific respiratory partnership services between primary and secondary providers? e.g., funded spirometry and sleep testing in the community.
27. Please indicate if your DHB provides any of the following dedicated respiratory services for Māori patients:

- Smoking cessation
- Asthma
- COPD
- Bronchiectasis
- Sleep apnoea

28. Please indicate if your DHB provides any of the following dedicated respiratory services for Pacific patients:

- Smoking cessation
- Asthma
- COPD
- Bronchiectasis
- Sleep apnoea

29. Does your DHB provide Pulmonary Rehabilitation?

- Yes
- No

30. Which type of programme does your DHB provide?

- Hospital Based Programme
- Community Based Programme
- Maintenance Based Programme
- Don't have any

31. If your DHB does provide a community based programme, how many community sites are there? Please answer with a number e.g., 2.

32. Does the Pulmonary Rehabilitation service accept direct referrals from general practitioners?

- Yes
- No
- Not applicable as no service
- Other comments

33. Does the Pulmonary Rehabilitation service accept direct referrals from nurse practitioners and/or physiotherapists?

- Yes
- No
- Not applicable as no service
- Other comments

34. How many referrals in total does the Pulmonary Rehabilitation programme receive per year? (If more than one programme type, please combine total)

35. How many patients complete the Pulmonary Rehabilitation programme per year? Complete is defined as equal or greater than 75% attendance.

**Part 4. Domiciliary oxygen**

36. In your DHB, how many adult patients are receiving community oxygen services?

37. In your DHB, how many adult patients are receiving long-term oxygen therapy (LTOT)?

38. How many adult patients are using portable oxygen?

39. Are the TSANZ guidelines and Ministry of Health specifications applied when oxygen is prescribed?

- Yes
- No
- Not sure

40. Is there a dedicated adult oxygen service physician?

- Yes
- No

41. Who can prescribe or approve Domiciliary Oxygen?

- Respiratory SMO only
- Respiratory and General Medicine SMOs
- Palliative Care Specialist
- General Practitioner
- Respiratory Nurse Practitioner or Nurse Prescriber
42. Do adult oxygen patients have a specialist review annually?
   • Yes
   • No

43. If adult patients do have a specialist review annually, who provides this review?
   • Physician
   • Respiratory NP/CNS
   • Respiratory RN

44. If adult patients do not have a specialist review annually, who assesses the patient?
   • District Nurse
   • General Practitioner
   • Other comment (e.g., don’t know)

Part 5. Sleep related breathing disorders

45. Does your DHB have a sleep laboratory?
   • Yes
   • No

46. If there is no sleep laboratory where do you refer patients to?
   • The DHB contracts with private provider
   • The DHB refers to another DHB
   • No service at all

47. Does your sleep laboratory also undertake Paediatric sleep studies?
   • Yes
   • No
   • Not sure

48. Please provide the number of tests for adult patients per category per year:
   • PSG/MSLT
   • Level 3
   • Level 4 e.g., Oximetry Only
   • tCO2 monitoring

49. Please provide the number of adult patients treated for the following categories:
   • CPAP New Patient (per year)
   • CPAP Long-Term follow-up

50. Please provide the number of paediatric patients on a NIV/PAP machine

51. Does your DHB provide new CPAP patients with a CPAP machine?
   • Yes
   • No
   • Comment:

52. Do CPAP patients have a scheduled hospital based annual review?
   • Yes
   • No

53. Does your DHB gift the CPAP machine to the patient?
   • Yes
   • No
   • Not sure

54. Does your DHB provide replacement parts (mask, tubing etc.) for the patient's CPAP machine?
   • Yes
   • No
   • Not sure

55. Does your DHB provide replacement parts (mask, tubing etc.) for the patients with BiPAP/VPAP/ASV machines?
   • Yes
   • No
   • Not sure

56. Does your DHB fund sleep studies provided in the community, either in general practice or at another community base?
   • Yes
   • No
   • If Yes, how many per year?
Part 6. Non-invasive ventilation

57. Does your DHB provide non-invasive ventilation (NIV) treatment for patients with neuromuscular disorders, congenital conditions such as Duchenne myopathy or conditions such as motor neuron disease?

• Yes
• No

58. Does your DHB provide non-invasive ventilation (NIV) for patients with chronic hypercapnic respiratory failure?

• Yes
• No

59. Does your DHB provide inpatient NIV for patients with acute respiratory failure?

• Yes
• No

60. Who provides this service?

• Emergency Department
• General Medicine
• Respiratory Medicine
• Intensive Care
• High Dependency Unit

61. Is there a lead respiratory physician for the acute NIV service?

• Yes
• No
• Not sure

62. Is this service audited?

• Yes
• No
• Not sure

63. When acute NIV is initiated in a general ward, what is the usual nurse to patient ratio?

• 1:1
• 1:2
• 1:4
• Not sure
• No policy

Part 7. Adult respiratory outpatient services

64. Does your DHB count general respiratory and sleep related referrals separately?

• Yes
• No

65. Please provide annual volumes for adult general respiratory outpatient services for the following:

• First Specialist Assessment (FSA)
• Follow-Up Appointments (FU)
• Non Face-to-Face FSA

66. Please provide annual volumes for adult sleep outpatient services, for the following:

• First Specialist Assessment (FSA)
• Follow-Up Appointments (FU)
• Non Face-to-Face FSA

67. Does your DHB use formalised triage prioritisation criteria for general respiratory referrals to the outpatient service?

• Yes
• No
• Not sure

68. Does your DHB use specific triage prioritisation criteria for sleep related breathing disorder referrals?

• Yes
• No
• Not sure

69. If Yes, please specify:

70. Does the respiratory service meet the Ministry of Health waiting time requirements – i.e., is the respiratory service Elective Services Patient Flow Indicator (ESPI) 2 compliant with no patients waiting longer than four months for a general respiratory FSA?

• Always
• Usually
• Sometimes
• Rarely
71. Does the respiratory service meet the Ministry of Health waiting time requirements – i.e., ESPI 2 compliant with no patients waiting longer than four months for a sleep related disorder FSA?

- Never
- Always
- Usually
- Sometimes
- Rarely
- Never

72. Has your DHB adopted HealthPathways?

- Yes
- No

73. Is HealthPathways used the respiratory service referral and triage process?

- Yes
- No
- Not sure

74. Does the respiratory service **reject any general respiratory** referrals?

- Yes
- No
- Not sure
- If answered Yes, list some examples of why a referral may be rejected:

75. Does the respiratory service **reject any sleep disorder** referrals?

- Yes
- No
- Not sure
- If answered Yes, list some examples of why a referral may be rejected:

76. For urgent respiratory FSAs do you see patients within two weeks?

- Always
- Usually
- Sometimes
- Rarely
- Never

77. For semi-urgent respiratory FSAs do you see patients within six weeks?

- Always
- Usually
- Sometimes
- Rarely
- Never

78. For routine respiratory FSAs do you see patients within four months?

- Always
- Usually
- Sometimes
- Rarely
- Never

79. For respiratory follow-up appointments do you see patients within the expected timeframe?

- Always
- Usually
- Sometimes
- Rarely
- Never

80. When booking follow-up appointments, do you use the acuity index?

- Yes
- No
- Not sure

### Part 8. Credentialing and accreditation

81. Has your adult respiratory service undergone external credentialing?

- Yes
- No
- Not sure
- If Yes, please indicate which year the credentialing took place

82. Has your respiratory laboratory undergone TSANZ accreditation?

- Yes
- No
- Not applicable (don’t have a respiratory laboratory)
- If Yes, please indicate which year the accreditation took place.
83. Has your sleep laboratory undergone Australian Sleep Association (ASA)/Australian National Association of Testing Authorities (NATA) accreditation?

- Yes
- No
- Not applicable (don’t have a respiratory laboratory)
- If Yes, please indicate which year the accreditation took place.

Part 9. Multidisciplinary team meetings

84. Does your DHB conduct multidisciplinary team meetings (MDM) for lung cancer?

- Yes
- No
- If Yes, please state how often these meetings are held e.g., weekly, fortnightly etc.

85. Does your DHB lung cancer MDM discuss patients from other DHBs?

- Yes
- No
- Not applicable (don’t have one)
- If Yes, please specify which DHB’s

86. If your DHB does not have a lung cancer MDM, do you refer your patients for case discussions to a larger centre MDM?

- Always
- Usually
- Sometimes
- Rarely
- Never

87. Does your DHB conduct multidisciplinary team meetings for interstitial lung disease?

- Yes
- No
- If Yes, please state how often these meetings are held e.g., weekly, fortnightly etc.

88. Does your DHB interstitial lung disease MDM discuss patients from other DHBs?

- Yes
- No
- Not applicable (don’t have one)

- If Yes, please specify which DHB’s

Part 10. Subspecialist respiratory services

89. If your DHB does not have an interstitial lung disease MDM, do you refer your patients for case discussions to a larger centre MDM?

- Always
- Usually
- Sometimes
- Rarely
- Never

90. Does your DHB conduct subspecialist clinics for adult cystic fibrosis patients?

- Yes
- No

91. If Yes, do you accept patients from other DHBs?

- Yes
- No

92. If Yes, please list the DHBs.

93. If your DHB does not have a subspecialist service for adult cystic fibrosis patients, do you refer your adult patients for reviews at a larger centre?

- Always
- Usually
- Sometimes
- Rarely
- Never

94. Does your DHB conduct subspecialist clinics for pulmonary artery hypertension patients?

- Yes
- No
- If Yes, do you accept patients from other DHBs?

95. If your DHB does not have a subspecialist service for pulmonary artery hypertension patients, do you refer your patients for reviews at a larger centre?
96. Does your DHB conduct subspecialist clinics for interstitial lung disease patients?

- Yes
- No
- If Yes, do you accept patients from other DHBs? Please list the DHBs.

97. If your DHB does not have a subspecialist service for interstitial lung disease patients, do you refer your patients for reviews at a larger centre?

- Always
- Usually
- Sometimes
- Rarely
- Never