診療所勤務医の状況の変化と多相生命表の原理を用いた医師数の将来推計について

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目的　医師需給についての考察をさらに深めるため，医師・歯科医師・薬剤師調査のデータを用いて診療所勤務医師（いわゆる開業医）の現状を明らかにするとともに，多相生命表の原理を用いて，医師の診療科間の移動の側面を考慮した医師の将来推計を行うことを目的とした。

方法　1972年から2004年調査までの医師・歯科医師・薬剤師調査データを用いて，各年度の調査について横断的に解析を行うとともに，医籍登録番号を用いて縦断的にデータを結合し，医師の勤務状況の変化について解析を行った。さらに，2002年と2004年調査から多相生命表の原理を用いて診療科別の医師数の将来推計を行った。

結果　診療所勤務医の年齢構成に経年的に変化が生じていることが明らかになるとともに，診療所勤務医を引退する年齢が上昇してきている可能性が示唆された。

2002年から2004年の移動率，および2004年の新規登録医師数が今後も変わらないと仮定した場合の医師数は，2010年で内科10.7万人，小児科1.6万人，精神科1.4万人，外科5.3万人，産婦人科1.2万人，その他8.9万人で合計29.0万，2020年で内科11.8万人，小児科1.8万人，精神科1.6万人，外科5.3万人，産婦人科1.2万人，その他10.2万人で，合計32.0万人と推計された。

結論　本研究で用いた多相生命表の原理を用いれば，診療科別の将来推計に加えて，病院，診療所といった勤務の種別，都市部と地方といった医師の地域分布についても推計が可能であることが示唆され，医師需給の議論を深化させる上で有益な情報を提供しうることが示唆された。新臨床研修を終えた者が最初に届け出を行う2006年医師・歯科医師・薬剤師調査のデータを用いることが可能となり次第，今回の結果と比較することで，新臨床研修制度が医師の診療科の選択・診療科間の移動に与えた影響を評価した形での将来推計を行う等，さらなる研究が推進されることが期待される。

キーワード　医師需給，医師・歯科医師・薬剤師調査，多相生命表，将来推計，キャリアパス

Ⅰ はじめに

わが国の医師の需給については，昭和45年に，「最小限必要な医師数を人口10万対150人とし，これを昭和60年を目途に充たすために医科大学の入学定員を増加させる必要がある」とされたことを受け，昭和48年から「無医大県解消構想」，あるいは「一県一医科大学」構想が推進され，医学部の入学定員は増加し，「人口10万対150人」の医師の目標は昭和58年に達成された。その後，毎年8,000人を超える医師が誕生していくことが見込まれる状況の中，昭和59年には，「昭和100（平成37）年には全医師の1割程度が過剰となる」との将来推計が出され，そ

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の後は，医師は過剰になるとの見通しがなされることとなった。一方，2000年頃からは，特定の地域や診療科について医師の不足について取り上げる新聞報道が増加して来る等，もっぱら医師不足が取り上げられることが多くなっている。

平成18年の「医師の需給に関する報告書」[1]によると，わが国では，病院，診療所とも，医師数は一貫して増加しており，また，地域別でみてもすべての地域で増加しているが，地域間格差は必ずしも減少の方向には向かっていないこと，また，国民の医師充足感は，全体の医師数のみではなく，国民の医療に対する質に関する期待をはじめ，時代，環境の変化を含めた多くの要因によって影響を受けるものであることが指摘されている。従って医師の需給について考えるに当たっては，医療の供給の側面として，医師の養成数に加えて，医師の転職，休職，引退，海外との流出入，病院勤務医と診療所勤務医，都市部と地方，診療科別の分布，医師とその他の職種の業務分担によって異なり，医療の需要の面として，医療技術の進歩や患者が求める医療水準の変化について考慮する必要がある。

そこで，本研究では，医師需給についての考察をさらに深めるため，特に昨今注目を集めている病院勤務医と診療所勤務医の移動の問題と，診療科別の医師数について着目をし，医師・歯科医師・薬剤師調査のデータを用いて，診療所勤務医師（いわゆる開業医）の現状を明らかにするとともに，婚姻の状況や地域間の移動を踏まえた人口推計に用いられる多相生命表の原理を用いて，医師の診療科間の移動の側面を考慮した医師の将来予測を行うこととした。

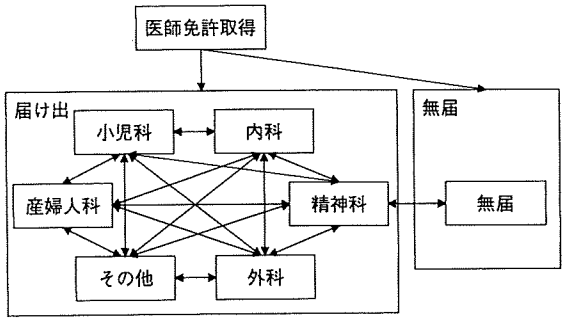
Ⅱ 方　　法

1972年から2004年調査までの医師・歯科医師・薬剤師調査データを用いて，各年度の調査について横断的に解析を行うとともに，医籍登録番号を用いて，縦断的にデータを結合し，医師の勤務状況の変化について解析を行った。さらに，2002年と2004年調査から多相生命表の原理を用いて診療科別の医師数の将来予測を行った。

本研究において，診療所勤務医は「診療所の開設者または法人の代表者」あるいは「診療所の勤務者」と定義した。また，医師・歯科医師・薬剤師調査では，診療科名が調査年ごとに分類が若干異なっているが，2004年調査を基準に補正を行った。２点の調査年（ｔ－２年，ｔ年）における医師の業務の種別および年齢を調査し，「診療所勤務医ではなくなった医師」および「病院勤務医から診療所勤務医に移動した医師」の人数および割合を年齢区分別に集計した。ｔ－２年において診療所勤務医であった医師が，ｔ年において，診療所勤務医でなくなった場合には，「診療所勤務医以外の業務の種別であった場合」に加え「医師届出が提出されていない場合」がある。なお，医師・歯科医師・薬剤師調査の届出率は，約90％[2)3)]であることが知られており，ｔ＋２年の時点における「届け出忘れ」を補正するため，ｔ年からｔ＋４年における調査において，１回以上の届け出があった場合には，「届け出忘れ」と見なし「診療所勤務医ではなくなった医師」から除外した。このため診療所勤務医でなくなった者は1974年から2000年の時点で診療所勤務医でなくなった者のみが分析の対象となっている。ｔ－２年において病院勤務医であった医師が，ｔ年において，診療所勤務医となった場合を「病院勤務医から診療所勤務医に移った医師」とし，1974年から2004年の時点で病院勤務医から診療所勤務医になった者を分析した。

多相生命表の原理を用いた診療科別医師数の将来推計に当たっては，７つの状態（内科，小児科，精神科，外科，産婦人科，その他医，無届）を設定し（図１），Peter Tiemeyer らが作成した生命表計算プログラム MSLT[4)]を用いて生命表を作成した。この際，医師のキャリアパスを研究する目的から，生命表を作成するに当たっては，卒後年数を通常の生命表で用いる年齢として用いた。なお，７つの状態の１つである無届には，生存しながら届け出忘れをしている者と死亡した医師の双方が含まれている点

図1　多相生命表モデル



診療科区分

内　科	内科，心療内科，呼吸器科，消化器科（胃腸科），循環器科，アレルギー科，リウマチ科，神経内科
小児科	小児科
精神科	精神科，神経科
外　科	外科，整形外科，形成外科，美容外科，脳神経外科，呼吸器外科，心臓血管外科，小児外科
産婦人科	産婦人科，産科，婦人科
その他	眼科，耳鼻いんこう科，気道食道科，皮膚科，泌尿器科，性病科，こう門科，リハビリテーション科，放射線科，麻酔科，全科，その他，無記入
無　届	無届

図2　業務の種別・医師数の推移

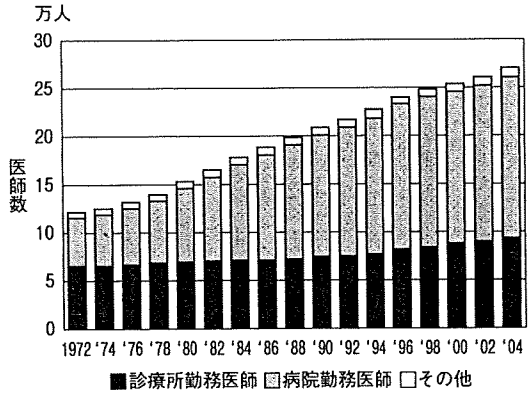
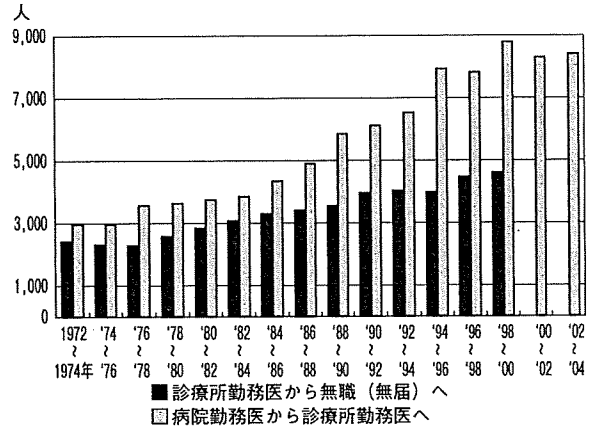


図3　診療所勤務医の流出入の状況



に注意が必要である。従って，無届を除いた６つの状態の合計は，医師・歯科医師・薬剤師調査では無職として届け出を行っている者を含み，調査への届け出を行った総数に相当する値である。また，医師免許交付数に対して，届出数が５％未満となる卒後67年で医師を引退するものとして扱った。なお，無届数の算出に当たっては，医籍登録年ごとの医籍名簿への登録者数[5]を用いて推計したが，登録年初交付番号表からは性別に関する情報が得られないため，登録以後初めて行われた調査時の男女比は，登録年における男女比に等しく，今回の研究ではデータが得られなかった1970年以前の登録者については，卒後30年または31年の調査時の性別から算出した登録時男女比が，登録年における男女比と等しいものと仮定した。

生命表の算出後，診療科別の医師数の将来推計を行うに当たっては，コホート要因法を用いた。この際の基準人口は2002年の医師・歯科医師・薬剤師調査における医師数を，生存率，移動率については，作成した生命表の値を，出生率については2004年の卒後年数０～１年の医師数を用いた。また，人口当たり医師数を求めるに当たっては「日本の将来推計人口」（中位推計）を用いた。

Ⅲ 結　果

（１） 診療所勤務医の年齢構成の経年変化

本研究が対象としている1972年から2004年までの期間に診療所勤務医は，約６万５千人から約９万人超と５割増加しているが，この期間に医師全体が約12万人から約27万人と２倍以上に増加しているのに比べると，その伸びは低い（図２）。診療所勤務医への流入，流出をみると，1980年代の中ごろまでは診療所勤務医への流入，流出がほぼ均衡していたが，その後は，病院勤務医から診療所勤務医に移った医師数が，

図4　診療所勤務医師の年齢構成

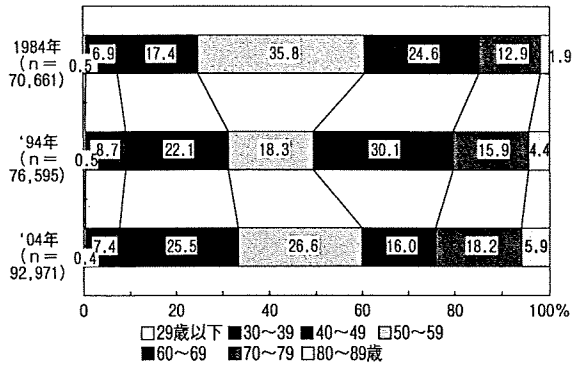


図5　病院勤務医から診療所勤務医に移った際の年齢構成

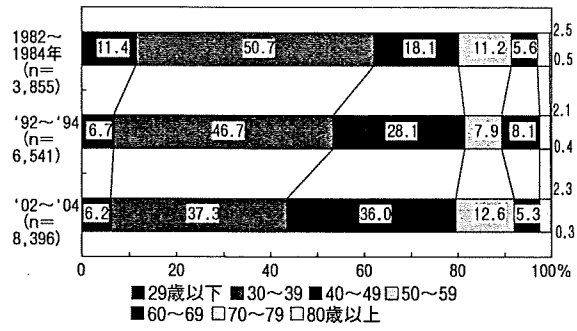


図6　診療所勤務医でなくなった医師の年齢構成

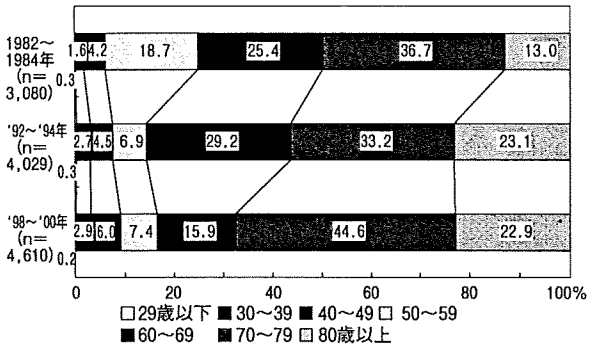
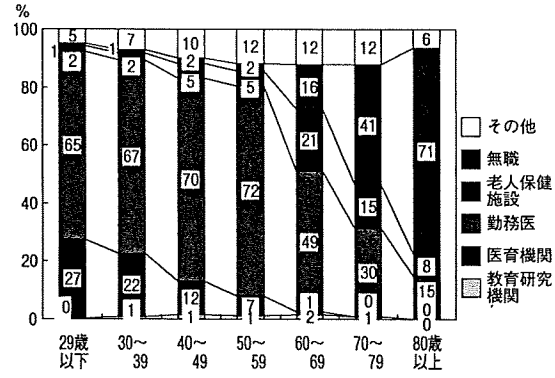


図7　2002－2004年に診療所勤務医でなくなった者の次の勤務先



診療所勤務医でなくなる医師を超えるようになり，全体として診療所勤務医の増加がみられる（図3）。

一方，1984年から2004年の診療所勤務医の年齢構成の変化をみると（図4），診療所勤務医の年齢構成そのものに大きな変化が生じており，50歳未満および70歳以上の診療所勤務医の割合がいずれも増加していること，それにともない50～69歳の割合が減少していることがわかる。1984年から2004年の間に診療所勤務医の数は全体で2倍以上に増加しているにも関わらず，50～69歳の診療所勤務医師が割合・実数とも減少していることは診療所勤務医師の世代交代を表すものとして注目される。

（2）　診療所勤務医への流入・診療所勤務医からの流出の状況

新たに病院勤務医から診療所勤務医になった者について，その年齢構成をみると（図5），近年は40歳未満で診療所勤務に移行する医師の割合が減り，40～49歳の診療所勤務医が増加してきている。一方，50歳以上で診療所勤務に移行する医師の割合にはそれほど大きな変化がない。ただし，病院勤務医から診療所勤務医に移った数は1982～1984年の3,855人から2002～2004年の8,396人と倍以上に増えているため，実数としてはいずれも増加している。

一方，診療所勤務医でなくなる医師については（図6），70歳以上で診療所勤務医でなくなっている者の割合が増加しており，診療所勤務医を引退する年齢が上昇してきている可能性が示唆された。診療所勤務医でなくなった者が，病院勤務医に戻る者も考えられることから，診療所勤務医でなくなった者の次の勤務先をみる（無届を除く）と（図7），年齢とともに医育機関（大学病院等），病院勤務医に移った医師が減り，60代から徐々に無職になる者も出始め，70歳を越えると無職になる者と有職者の割合を超え，医師を引退してゆくことが明らかとなっている。

（3） 診療科別将来推計

2004年の卒後年数０～１年の医師数，男性10,097人（内科2,702人，小児科328人，精神科226人，外科1,640人，産婦人科120人，その他4,814人，無届267人），女性5,061人（内科1,256人，小児科289人，精神科117人，外科434人，産婦人科185人，その他2,646人，無届134人）を基準人口として，2002年から2004年の移動率，および2004年の新規登録医師数が今後も変わらないと仮定した場合の将来医師の推計数を示したものが表１である。

診療科医師数は，2010年で内科10.7万人（人口10万人当たり84人），小児科1.6万人（同12人），精神科1.4万人（同11人），外科5.3万人（同42人）産婦人科1.2万人（同９人），その他8.9万人（同70人）で合計29.0万人（228人），2020年で内科11.8万人（人口10万人当たり96人），小児科1.8万人（同15人），精神科1.6万人（同13人），外科5.3万人（同43人），産婦人科1.2万人（同10人），その他10.2万人（同84）で合計32.0万人（261人）と推計された。

表1 医師の将来推計

（単位 人）

	総数	診療科別					
		内科	小児科	精神科	外科	産婦人科	その他
実数							
1996	240 214	93 580	13 737	10 666	51 646	12 389	58 196
1998	248 274	95 892	13 972	11 067	53 109	12 434	61 800
2000	253 896	98 638	14 071	11 636	54 035	12 371	63 145
2002	261 093	99 928	14 390	12 139	54 497	12 329	67 810
2004	269 572	101 378	14 648	12 581	54 761	12 130	74 074
2006	277 927	99 842	14 700	12 829	53 489	11 783	84 200
推計							
2006	276 843	102 591	14 883	13 139	53 827	11 788	80 615
2008	283 502	104 557	15 192	13 631	53 159	11 628	85 336
2010	290 138	106 978	15 580	14 098	52 811	11 589	89 082
2012	296 601	109 438	16 044	14 546	52 688	11 629	92 256
2014	302 946	111 811	16 535	14 996	52 726	11 705	95 173
2016	309 140	114 101	17 067	15 431	52 828	11 814	97 899
2018	314 827	116 194	17 598	15 839	52 946	11 948	100 302
2020	320 292	118 132	18 139	16 218	53 018	12 101	102 683
2022	320 292	118 132	18 139	16 218	53 018	12 101	102 683
2024	325 587	119 881	18 662	16 603	53 087	12 255	105 100

Ⅳ 考　　察

（1） 診療所勤務医師の状況について

1972年以降の医師数全体の伸びの多くは，診療所勤務医以外の伸びによるものが大きく，診療所勤務医数についてはそれほど大きな変化がないようにみえる。しかしながら，診療所勤務医への流入，流出について年齢別に分析を行うと，第２次世界大戦後から10年ほどの間に医師免許を取得している，いわば団塊世代の医師の引退を1970年以降に医師免許を取得している世代が埋めているという医師の世代交代の様子がわかる。

この背景には，わが国の医師の養成数が一定でないことが背景にある。わが国で新規に医師になる者は，1930年代には約3,000名程度で推移していたが，第２次世界大戦時に急減，戦後からは一転して１年間に8,000名程度に急増し，その後，3,000名程度に戻り，その後の一県一医大構想を踏まえて約8,000名程度にまで増え，その後ほぼ同一レベルとなっている点がある。特にわが国では，海外からの医師の流出入については大きな影響を及ぼさないという点では，医師の養成数が医師の供給において非常に大きな要素となると考えられる。

診療所勤務を離れた者の次の勤務地の分析からは，多くの医師にとって，医育機関を含む病院勤務医としてキャリアを開始し，ある年齢までは診療所勤務医と行き来をすることはあっても，最終的には診療所勤務医としてそのキャリアを終えることが標準的であることが確認された。

医師・歯科医師・薬剤師調査では，移動の理由についての調査はできず，因果関係を明らかにすることはできないものの，本研究で明らかとなった病院勤務医ー診療所勤務医間の移動の状況の変化の背景には，医療の高度化，医療の受け手の側の意識変化に伴う，医療現場，特に病院勤務医の労働環境の悪化[6]も背景にある可能性が示唆されている。

（2） 生命表について

本研究では，多相生命表の原理を用いて診療科別の将来推計を行った。通常の生命表は，

「生存」と「死亡」の２つの状態しか存在しないが，その状態を３つ以上の場合へと拡張したものが，Robert Schoen が開発した increment-decrement life table[7]や Andrei Rogers が開発した multi-regional life table[8]である。これらは多相生命表とも呼ばれる。従来は，減少のみのものしか扱えなかった生命表であるが，人口の増減を扱える生命表が開発された。このような生命表は，労働力分析，結婚分析，出生力分析など様々な方面へと応用されている。

医師数の推計は，過去の厚生労働省における検討会で幾度か実施されてきた。昭和61年の「将来の医師需給に関する検討委員会最終意見」（佐々木委員会），平成６年の「医師需給の見直し等に関する検討委員会意見」（前川委員会）[9]，10年の「医師の需給に関する検討会報告書」（井形委員会報告書）」[10]，18年７月の「医師の需給に関する検討会報告書（矢崎委員会）」である。

長谷川による平成10年，18年の推計方法（以下，「平成10年モデル」「平成18年モデル」）の比較表[11]に，今回の著者らが行った推計方法を加え，比較を行ったものが表２である。平成10年モデルでは，ある年次の医師数から，当該年次の死亡医師数を減じ，次年次の新規参入医師数を加えることにより次年次の供給医師数を推計し，これを繰り返すことで将来の供給医師数を推計するという生命表の原理を用いたモデルを用い，平成18年推計では，免許取得後１年ごとの男女別，病院，診療所別の就業率を用いた卒後１年階級コホートモデルを用いた。

平成10年モデルでは生存率は当時の生命表に基づいた推計，平成18年モデルでは卒後年数別の就業率を生命表の死亡率の代替として用いた推計が行われている。本研究では死亡率を考慮せず就業率を用いている点で後者の推計と類似しているが，特に病院・診療所ではなく，７種の診療科を勘案している点で異なる。また，本手法では卒後67年で医師から離脱すると仮定している点で，平成10年モデルで70歳の定年制導入，平成18年モデルで卒後年数ごとの就業率を勘案した推計の両案と重なるが，定年を2002年の就業者年齢から割り出している点に特徴がある。また女性医師については，今回は登録時男女比を用いているため平成18年モデルよりやや精度に欠けるが，各診療科に細分した場合，女性医師数が少数のためモデル化に適さない可能性があり，妥当な方法と考える。

表２　過去の推計方法との比較

方法	平成10年モデル	平成18年モデル	今回推計
基本概念	生命表に基づき就業率を勘案した年齢５歳階級モデル	医籍登録と医師・歯科医師・薬剤師調査に基づく就業率を用いた卒後1年階級コホートモデル	多相生命表の原理を応用して求めた診療科グループ別移動確率を元にコホート要因法を用いて推計
就業率	医師・歯科医師・薬剤師調査（５年ごと）	医師・歯科医師・薬剤師調査数／登録数（免許取得後１年ごと，男女別，病院，診療所別）	生命表によって得られる診療科グループ別移動確率（医籍登録後２年ごと）
過去基点医師数	7,705人	各年度登録医師（１年ごと，1945～2004年）	医籍登録後年数別医師数（2002年調査時）
新規医師数	入学定員7,705人（1997年医学部定員）入学定員対合格率98％	7,700人（2006年医学部定員）入学定員対合格率100％	2004年の医籍登録後０～１年の医師数
定年	2010年より70歳	無	医籍登録後67年
女性の労働量に関する重み付け	女性　70％	性別の就業率を反映	性別の推計就業率を反映

注　長谷川が作成した平成10年モデル，平成18年モデルの比較表[11]に基づき今回推計内容を追加した。

今回の推計では2004年までのデータを用いているが，最近公表された2006年（平成18年）医師・歯科医師・薬剤師調査の結果[12]と比較した場合，内科，小児科，精神科，外科，産婦人科，その他，合計の別に推計値－実測値の差は，2,749（2.8％），183（1.2％），310（2.4％），338（0.6％），５（0.0％），－3,585（－4.3％），－1,084（－0.4％），（推計値／実測値－１）とほぼ同じ傾向を示している。また，平成18年推計においては，「活動医師数」を推計しており，著者らが届出医師数として含め，無職として届けている者が除かれている点を考慮に入れれば，ほぼ同一の傾向を示していると考えることができる。

今回の将来推計では，医師の養成数が変わらない，現行の診療科選択の傾向が変わらないことを前提としているものの，今回の推計結果を2006年の実測値と比較した場合にそれほど大きな変化がなかった。2004年に始まった新臨床研修制度が医師の診療科の選択やキャリアパスへの影響について分析をするうえでは不十分であるため，本年から入手可能となる2006年データを今回の分析と比較する等さらに詳細な解析が必要となっている。

Ⅴ おわりに

本研究では診療所勤務医師の状況を明らかにするとともに，多相生命表の原理を用いて診療科別医師数の将来推計を行った。この多相生命表の原理を用いれば，今回試算した診療科別の将来推計に加えて，病院，診療所といった勤務の種別，都市部と地方といった医師の地域分布についても推計が可能である。また，2004年には臨床研修の必修化が行われており，臨床研修を終えた者が最初に届け出を行う2006年医師・歯科医師・薬剤師調査のデータを用いることができれば，今回の結果と比較すること等が可能となる。今後，診療科選択傾向の変化ついての分析を行うこと等が，さらなる研究のうえ推進されることが期待される。

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Original Article

Shortage of pediatricians in Japan: A longitudinal analysis using physicians' survey data

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Abstract ***Background***: Currently, there is a shortage of hospital pediatricians in Japan. In the present study, using data from the Survey of Physicians, Dentists, and Pharmacists in Japan, we analyzed the dynamics and distribution of pediatricians, using a time series approach.

Methods: The total number of pediatricians, the ratios of hospital-working and female pediatricians, their mean age and geographic distribution in 1974, 1984, 1994, and 2004 were determined. The dynamics of pediatricians were analyzed by identifying the annual number of physicians participating in and withdrawing from pediatrics, and by following up withdrawal rates from pediatrics and movement rates from hospitals. The withdrawal rates of male and female pediatricians registered in 1992, 1994, and 1996 were also analyzed.

Results: The number of pediatricians per 10 000 children increased from 1.9 to 7.4 between 1974 and 2004. The percentage of women among pediatricians was significantly higher than that of women among all physicians in 2004 ($P < 0.01$). The numbers of physicians who withdrew from pediatrics increased from the periods 1985–1994 to 1995–2004. Younger pediatricians tended to leave pediatrics earlier than elder pediatricians. There were no differences in the withdrawal rates of pediatricians between men and women registered in 1992, 1994, and 1996.

Conclusions: It is anticipated that the number of pediatricians in Japan will decrease in the near future unless practical strategies are implemented to improve the early withdrawal of younger pediatricians and the current working conditions of female pediatricians.

Key words health manpower, pediatricians, physician shortage.

Introduction

Physician shortage is currently one of the major political issues in Japan. In particular, the shortage of pediatricians is a serious social problem. Experts claim that the pediatric medical system in Japan is in danger of collapse due to overwork of pediatricians, excessive requirements of patients and their families, and poor social support.[1] Wada *et al.* reported that the mean number of working hours for hospital pediatricians in Japan in 2004 was 55.9 h/week. In particular, physicians in their twenties worked excessively, around 43 extra hours during weekdays and 17.3 extra hours during weekends and holidays each month.[2]

The Ministry of Health, Labour and Welfare (MHLW) conducts a Survey of Physicians, Dentists and Pharmacists (SPDP) every two years, and provides descriptive statistics of the Survey. These statistics indicate that the total number of pediatricians in Japan has been increasing gradually. However, little is known about the trends and distribution patterns of pediatricians. To confirm the reality of this shortage of pediatricians, it is necessary to clarify how many graduates enter into pediatrics, how long current pediatricians have been in practice, and when pediatricians leave hospital work.

In the present study, we obtained all the individual data of the SPDP from the MHLW, and restructured the longitudinal data for each physician by retrieving their unique registration numbers, which were given to all physicians sequentially who passed the national examination in Japan. Using this retrospective data, we analyzed the dynamics of the pediatricians.

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Methods

Data acquisition

For this survey, the electronic files of all physicians during the period 1972 to 2004 were provided by the MHLW. Data cleaning

was performed to complete the data collection, and a total of 4 024 916 data (374 804 physicians) were obtained. All physicians were obligated to submit the survey information, and the submission rate was approximately 90%.[3] The survey items included the year their medical licenses were obtained, physician registration number, date of birth, sex, address of workplace, department, and occupation. The Privacy Act defines personal information as information that enables any other entity to identify a person, or that easily enables someone to do so using other sources of information. However, the data we used here did not include any personal information from which an individual could be identified.

Descriptive statistics

The total number of physicians, the number of physicians per 100 000 of population, mean age, percentage of female physicians, and the percentage of physicians working in hospitals in 1974, 1984, 1994, and 2004 were collected for analysis.

The total number of pediatricians, number of pediatricians per 10 000 children aged less than 15 years, mean age of pediatricians, percentage of female pediatricians, and the percentage of pediatricians working in hospitals were also determined. The population in each of the years studied was obtained from the Population Estimate carried out by the Statistics Bureau, Ministry of Internal Affairs and Communications.

Survey of trend in pediatricians

The number of physicians registered as pediatricians in 1974, 1984, 1994 and 2004, was defined as N1, N2, N3, and N4, respectively. In N1, the number of physicians who withdrew from pediatrics during the period 1975–1984 was defined as R1, and the number of physicians who continued to work in pediatrics was defined as C1. During the period 1975–1984, the number of newly graduated physicians who selected pediatrics was defined as F1 and the number of physicians who changed from other departments to pediatrics was defined as I1. Similarly, during the period 1985–1994 and the period 1995–2004, the number of physicians who withdrew from pediatrics, the number of physicians who continued to work in pediatrics, the number of new graduates, and the number of physicians changing from other departments to pediatrics were defined as R2, C2, F2, and I2; and R3, C3, F3, and I3, respectively. The relation between these variables is described in the following equations:

$$N1 = R1 + C1, N2 = C1 + F1 + I1$$

$$N2 = R2 + C2, N3 = C2 + F2 + I2$$

$$N3 = R3 + C3, N4 = C3 + F3 + I3.$$

The dynamics of pediatricians were analyzed by identifying each variable.

Withdrawal rate from pediatrics to other specialties

Pediatricians who obtained their medical licenses in 1972, 1982, and 1992 were defined as the Classes of 1972, 1982, and 1992, respectively. These three cohorts were followed up to determine the percentage of physicians who withdrew from pediatrics to other specialties.

Difference in withdrawal rates of younger pediatricians between men and women

The Classes of 1992, 1994, and 1996 were defined, and the numbers of male and female physicians withdrawing from pediatrics were investigated.

Withdrawal rate from hospitals

We chose pediatricians who obtained their medical licenses and began working in hospitals in 1972, 1982, and 1992. The percentage of pediatricians who moved from hospitals was determined.

Statistical analyses

We used *t*-tests to compare means between the two groups, and χ^2-tests to compare ratios between the two groups. Log–rank tests were used to compare differences in withdrawal rates. All statistical analyses were performed using statistical software SPSS ver.13.0 (SPSS, Chicago, IL, USA). A *P*-value less than 0.05 was considered significant.

Results

Statistical data

Table 1 shows the descriptive statistics in 1974, 1984, 1994 and 2004. The number of pediatricians increased gradually from 1974 to 2004. The number of physicians per 100 000 of the population almost doubled in 1974 to 2004, and the number of pediatricians per 10 000 children during the same period more than tripled.

The percentage of all physicians working in hospitals increased from 1984 to 2004, while the percentage of hospital pediatricians decreased. The percentage of female physicians increased from 1974 to 2004. During the same period, the percentage of female pediatricians also rose and the percentage of female pediatricians was significantly higher than that of female physicians in 2004 ($P < 0.01$). The mean age of pediatricians was significantly higher in 2004 (47.7 years) than in 1984 (42.2 years) ($P < 0.01$), but the mean age of all physicians was relatively stable during the study periods. Consequently, the mean age was the same for both pediatricians and all physicians in 2004.

Trend in pediatricians

Figure 1 shows the trend in pediatricians between 1974 and 2004. Up to 2004, the sum of the number of new graduates and the number of physicians who changed from other departments to pediatrics exceeded the number of physicians who withdrew from pediatrics (F + I > R). The number of new graduates was stable during the entire study period. As a result, the total number of pediatricians increased from 1974 to 2004.

When the time periods 1975–1984 and 1985–1994 were compared, the total number of pediatricians approximately doubled, and the percentage of pediatricians who continued practicing in pediatrics gradually increased. When the time periods 1985–1994 and 1995–2004 were compared, even though 63% of pediatricians in 2004 had stayed in pediatrics since 1994, the number of physicians who changed from other departments to pediatrics

Table 1 Statistical data

	1974	1984	1994	2004
All physicians				
Total	125 249	178 197	227 775	270 353
Number per 100 000 population	113	148	182	212
Female (%)	9	10	13	16
Age (average ± SD in years)	47.5 ± 13.0	46.8 ± 14.9	46.6 ± 15.4	47.6 ± 15.2
Working in hospitals (%)	43	56	62	62
Pediatricians				
Total	5364	8914	13 186	14 677
Number per 10 000 children (<15 years)	1.9	3.1	5.9	7.4
Female (%)	25**	24**	27**	31**
Age (average ± SD in years)	43.5 ± 13.0**	42.2 ± 13.6**	46.9 ± 14.9*	47.7 ±14.7
Working in hospitals (%)	57**	68**	58**	57**

*$P < 0.05$, **$P < 0.01$.
The reference values for comparison in the table were all physicians' values. SD, standard deviation.

decreased (I2 > I3), whereas the number of physicians who withdrew from pediatrics increased (R2 < R3). Moreover, the percentage of withdrawn pediatricians rose from 26% during 1985–1995 to 30% during 1995–2004, which was the same as that during 1975–1984.

Withdrawal rate from pediatrics to other specialties

Figure 2 shows the cumulative withdrawal rates from pediatrics to other specialties. Pediatricians in the Class of 1992 withdrew more rapidly than those in the Class of 1972 ($P < 0.01$). It took over 15 years for 10% of the Class of 1972 to leave pediatrics, but it took less than ten years for the same percentage of the Class of 1992 to leave; 43 of 333 young pediatricians of the Class of 1992 had already left pediatrics by 2004.

Differences in withdrawal rates of younger pediatricians between men and women

The percentage of women in each of these Classes was 35%, 45%, and 48%, respectively. Figure 3 shows the variation in withdrawal rates in men and women. For each class, no significant difference between male and female pediatricians was observed.

Withdrawal rate from hospitals

The number of pediatricians who worked in hospitals at the beginning of their career in the Classes of 1972, 1982, and 1992 were 200, 399, and 326, respectively. The log–rank test showed no significant differences in withdrawal rates among these Classes (Fig. 4).

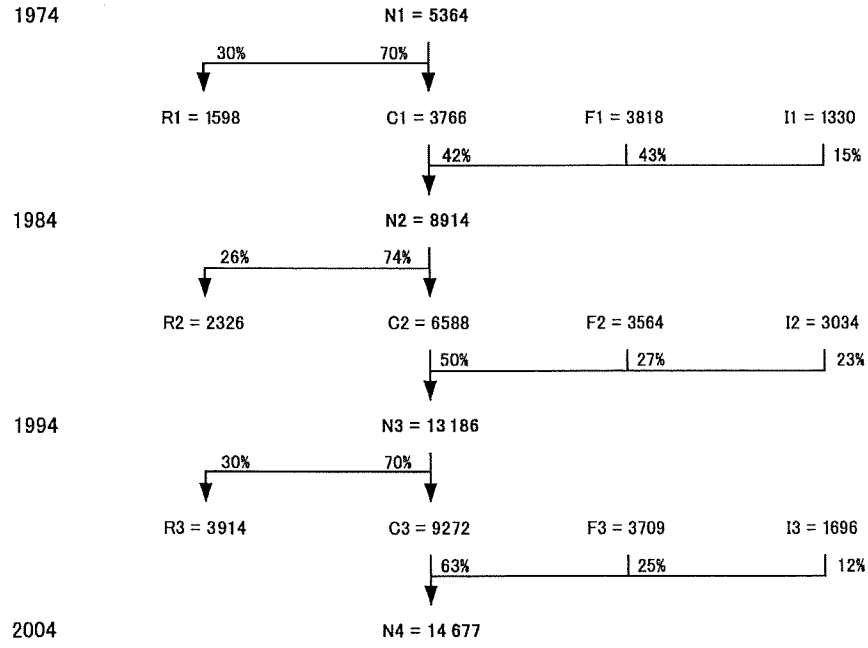

Fig. 1 Trend in pediatricians.
N1, the number of physicians registered as pediatricians in 1974; N2, the number in 1984; N3, the number in 1994; N4, the number in 2004.
R1, the number of pediatricians who withdrew from the department of pediatrics between 1975 and 1984; R2, between 1985 and 1994; R3, between 1995 and 2004.
C1, the number of pediatricians who remained in the department from 1974; C2, from 1984; C3, from 1994.
F1, the number of new graduates who chose pediatrics as their medical specialty between 1975 and 1984; F2, the number between 1985 and 1994; F3, the number between 1995 and 2004.
I1, the number of physicians who changed their specialty from other departments to pediatrics from 1975; I2, from 1985; I3, from 1995.

Fig. 2 Survey of withdrawal rate from pediatrics.
P-values for the comparisons between the Classes of 1972 and 1982, 1972 and 1992, and 1982 and 1992 were 0.698, 0.044, and <0.001, respectively. Thin line, Class of 1972 ($n = 205$); dotted line, Class of 1982 ($n = 406$); thick line, Class of 1992 ($n = 333$).

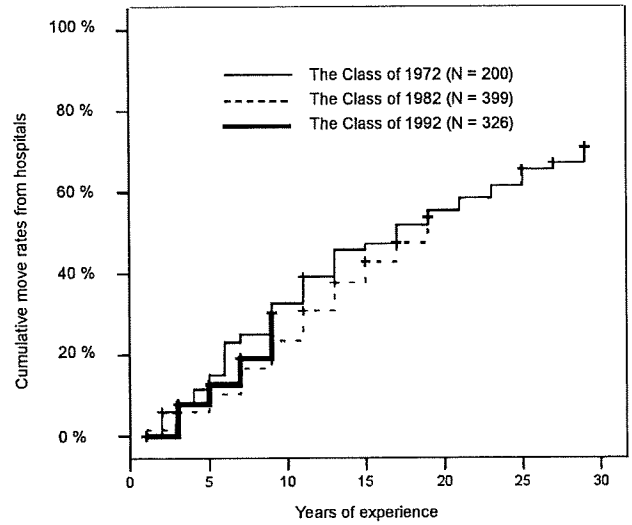

Fig. 4 Survey of movement rate of pediatricians from hospitals.
P-values for the comparisons between the Classes of 1972 and 1982, 1972 and 1992, and 1982 and 1992 were 0.254, 0.371, and 0.060, respectively. Thin line, Class of 1972 ($n = 200$); dotted line, Class of 1982 ($n = 399$); thick line, Class of 1992 ($n = 326$).

Discussion

A comprehensive trend in the pediatricians' workforce

Our study found a trend in the pediatricians' workforce over 30 years. We found that the withdrawal rate from pediatrics decreased during 1985–1994 and that the number of pediatricians has gradually increased. However, the withdrawal rate during 1995–2004 increased again. Moreover, in recent years, younger pediatricians have tended to leave pediatrics earlier. As a result, the average age of pediatricians is gradually rising.

A limitation in the present study is that it did not clarify the reasons why pediatricians recently decided to change their

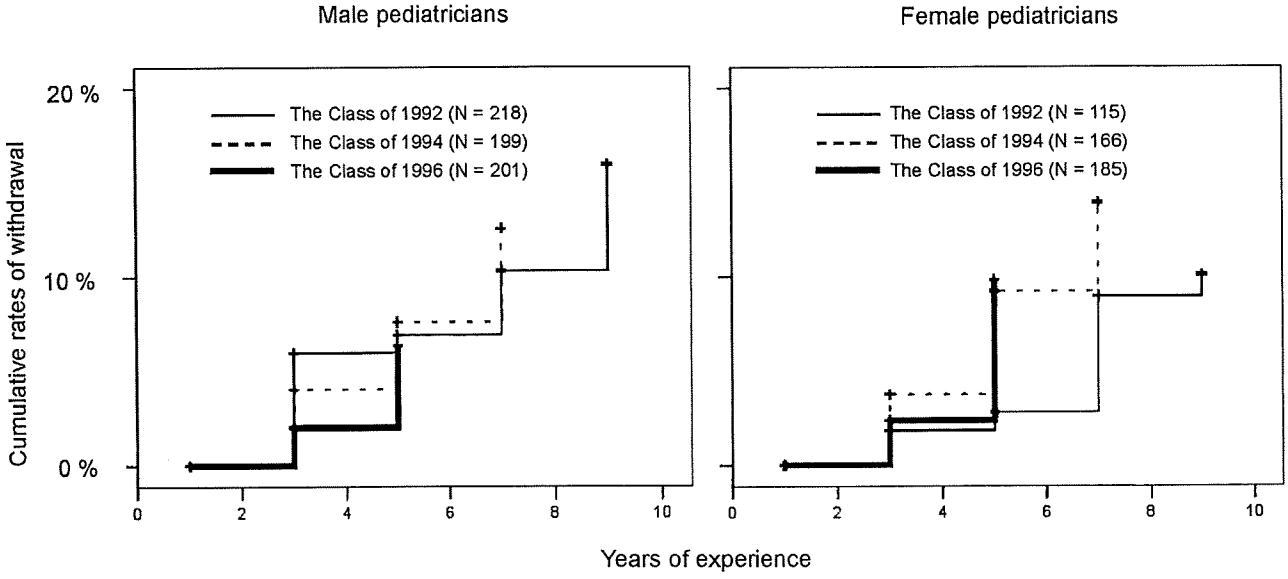

Fig. 3 Survey of withdrawal rate from pediatrics of male and female pediatricians.
P-values for the comparisons between men and women of the Classes of 1992, 1994, and 1996 were 0.176, 0.711, and 0.249, respectively. Male pediatricians: thin line, Class of 1992 ($n = 218$); dotted line, Class of 1994 ($n = 199$); thick line, Class of 1996 ($n = 201$). Female pediatricians: thin line, Class of 1992 ($n = 115$); dotted line, Class of 1994 ($n = 166$); thick line, Class of 1996 ($n = 185$).

careers. Their actual motives for leaving pediatrics should be investigated, and an estimate of future workforce requirements will be necessary.[4–6]

Current problems of the distribution and roles of pediatricians

The actual number of pediatricians is increasing, and the number of pediatricians per 10 000 children during 1994 to 2004 has more than tripled (1.9 to 7.4). Nevertheless, Japanese pediatricians and society in general feel that the shortage of pediatricians is serious. There are several potential problems affecting the pediatrics workforce. First, the distribution of pediatricians among facilities in Japan is poor. The number of hospitals with a pediatric department is approximately 3500, and the average number of pediatricians per hospital is 2.4.[7] Centralization of pediatric hospitals is necessary, as has been proposed by the Japan Pediatric Society.[1] If centralization is not possible, other probable measures include concentrating the pediatric workforce to draw more pediatricians from clinics to hospitals and retain more pediatricians working in the hospital for longer periods unless they move hospitals to clinics.

Secondly, the role of hospital physicians and clinic physicians should be well-defined. Because free access is not restricted in Japan, patients are allowed to have their primary care at outpatient departments in hospitals, as well as in clinics. According to a survey conducted in 2005 by the Japan Pediatric Association, 61% of a hospital pediatrician's working time is devoted to primary care.[7]

Thirdly, training more family physicians will alleviate the current shortage of pediatric practice. In the USA where family physicians are trained, family physicians provide 25% of primary care office visits for children younger than 15 years.[8] Internists receive pediatric training in primary care and can provide a part of pediatric care.[9]

Increasing numbers of female pediatricians

Our results also showed that the number of female pediatricians is rising. Although the withdrawal rates of younger pediatricians were similar in female and male pediatricians, the increase in the number of female pediatricians has the potential to reduce net working hours in pediatric care because female physicians, including female pediatricians, leave their jobs temporarily due to maternity and childcare leave. This phenomenon has often been pointed out, and one previous study clearly captured this quantitatively.[10]

Policy makers should take measures to support female pediatricians so that participating in pediatric practice and raising their children are compatible. To make this happen, improvement of the working conditions for female pediatricians is necessary. For example, part-time job opportunities may be an attractive option. In the USA, the percentage of female pediatricians increased by 9% between 1993 and 2000, and the percentage of part-time female pediatricians increased from 24% to 28%.[11] A similar trend in the working hours of female pediatricians could appear in Japan. This measure would also be a quick-acting method rather than educating more medical students to be pediatricians.

Measures for the future pediatric workforce

Younger pediatricians are more likely to leave pediatrics earlier and the number of female pediatricians is increasing. Practical strategies should be implemented to improve the current conditions of the pediatric workforce, especially for younger pediatricians and female pediatricians. If this situation is not rectified, it is anticipated that the number of pediatricians in Japan will decrease in the near future.

Acknowledgments

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A future estimate of physician distribution in hospitals and clinics in Japan

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ABSTRACT

Objectives: To make future estimates of physician distributions in hospitals and clinics to better understand the impact of recent health policy changes in post graduate clinical education, and to discuss possible policy implications.
Methods: Analyze National Surveys Data conducted from 1972 to 2004. Multistate Life Table was used to make future estimations of numbers of physicians in hospitals and clinics.
Results: A typical Japanese physician's career would start from academic hospitals, and move through non-academic hospitals to clinics. After the introduction of the new post-graduate clinical training system in 2004, more medical school graduates started their careers at non-academic hospitals. Recently, the flow of physicians from academic hospitals to non-academic hospitals has been declining while the flow from academic hospitals to clinics has slightly increased. We also observed a shift of physicians from hospitals to clinics. From the data we estimated that the number of physicians working at clinics will be almost equal to those at non-academic hospitals in 2016, for the first time in 30 years.
Conclusions: It is important to discuss the appropriate sharing of roles, responsibilities, and cooperation among medical facilities in line with the observed changes of career paths and physician distributions

1. Introduction

The issue of physician distribution has always been a central issue in the health policy arena. However, no nation has found the key to solving the disparities between physician supply and demand [1]. In Japan, although the number of physicians working at hospitals and clinics has been increasing, the distribution of physicians in hospital and clinics is still unfavorable. Even after a considerable increase in the number of practicing physicians between 1980 and 1990 [2], the inequality in physician distribution did not improve.

The post-graduate clinical training system in Japan has changed several times since World War II. In 1946, a 1 year internship system to qualify for the national examination was introduced. In 1968, this intern system was moved to the post-graduate clinical training program wherein the Ministry of Health, Labour and Welfare (MHLW) strongly recommended clinical training after passing the national examination. Since then, most medical school graduates have started their careers at academic hospitals, and then moved to non-academic hospitals and clinics.

In 2004, a new health policy was introduced to mandate a 2-year post graduate clinical training for new medical school graduates [3–6]. Before the new system was intro-

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duced, most medical school graduates directly received post-graduate medical training in their medical schools' affiliated academic hospitals, and completed their program there. Most of the training programs had been dominated by a single specialty, whereas the new system mandated rotating specialty training for residents. Under the new system, an increase of the number of training programs offered in non-academic hospitals and the introduction of a system which matches applicants' needs and available training places at a national level caused a considerable change in the career patterns of Japanese resident physicians. As of 2008, 46.4% of post-graduate medical trainees were working in academic hospitals. This rate is considerably lower than that in 2003 when 72.5% worked in academic hospitals [7].

This study's objective is to make a future estimate of physician distribution in hospitals and clinics to better understand the impact of this change and to discuss possible policy implications, given the health policy transition for post-graduate medical education.

In the US, Human Resources and Service Administration Bureau of Health Professionals (HRSA-BHPr) at DHHS conducted a physician supply and demand projection. A recent projection is to 2010 [8] for 35 specialties. The HRSA-BHPr model was also used to project other health professionals [9–12]. The demand approach model was also applied for projection of specialty-specific demand for physician services in Japan [13]. Several government committees launched physicians' future estimates in Japan [14], with various approaches. However, to the best of our knowledge, in Japan, there has been no previous attempt since the new health policy on postgraduate clinical training system was introduced in 2004 to estimate physicians by type of medical facility, including academic hospitals, and by type of municipality.

2. Materials and methods

We obtained data from the National Surveys of Physicians, Dentists, and Pharmacists conducted from 1972 to 2004 from the MHLW. All the surveys were completed at the end of December in each survey year. The survey questionnaire included year of qualification, registration number, year of birth, gender, address and type of workplace, and specialty. Data provided from MHLW did not include the names of the physicians or names of the facilities. After data cleaning, a total of 4,024,916 data for 374,804 physicians were obtained for analysis.

To present the changes of the physicians' work places by registration year, the 1954, 1964, 1974, 1984, 1994 and 2004 registration cohorts were selected. By their type of facility (academic hospital, non-academic hospital, clinics, and others), line graphs of the participation rates were drawn based on the number of years since registration as a physician. The number of physicians "not reported" was obtained from the difference between the number of medical licenses issued by the MHLW [15] and the numbers reported. Because only data after 1972 was available and physicians who received their medical licenses prior to 1972 were included, some lines start some years after receipt of medical licenses.

To illustrate physicians' career transfer patterns in a certain period of time, those who have reported for both the 1992 and 1994 surveys and both the 2002 and 2004 surveys were selected to present the flow among the different types of facilities in the given 2 years of the survey period. In this analysis, pair data (1992–1994 and 2002–2004 data) were matched based on the physician registration numbers. In this analysis, only those who responded to both surveys were analyzed.

A Multistate Life Table was used to estimate the number of future physicians by facility type and category of municipality. The conventional life table deals with only "dead" or "alive" whereas Multistate Life Table deals with broader categories [16,17].

We defined 11 statuses for our estimation, 1 for academic hospitals; 4 for non-academic hospitals (in the 14 big cities, core cities, other cities, and towns/villages); 4 for clinics (in the 14 major cities, core cities, other cities, and towns/villages); 1 "others"; and 1 "not reported". Based on the status changes in the two most recent data (2002 and 2004 survey), we estimated the future numbers of physicians for the 11 statuses mentioned above. The number of physicians in 2004 was set as the base population and 2003 and 2004 new entrants were used to predict new entrants for the estimation period. "Types of municipalities" were defined based on Japanese administrative district categories, namely, 14 big cities (Tokyo special district and cities with populations above 500,000); core cities (cities with populations above 300,000); other cities; and towns/villages. Any mergers and changes in the categories of municipalities between 2002 and 2004 were unified into the municipalities as of 2004. The Multistate Life Table software "MSLT" [18] was used to create the Multistate Life Table.

3. Results

3.1. Physicians' career choice by facility type

Fig. 1 shows the number of physicians in each type of facility ("academic hospitals", "non-academic hospitals", "clinics", and "not reported") tracked by the number of years since their registration as a physician.

Those registered before 1994 generally started their careers as physicians at academic hospitals. They then gradually moved to other hospitals. Ten years after registration, nearly half of the physicians were working at hospitals. Thereafter, the number of these physicians working at clinics started to increase, and at 20–30 years after their registration, those working at clinics outnumbered those working at hospitals. Around this time, the number of physicians working at academic hospitals accounted for less than 10%. Thirty years later, the number of "not reported" cases started to increase. Fifty years later, nearly half of the physicians were "not reported".

Physicians registered in 2004 showed a different career pattern, they generally started their careers at non-academic hospitals rather than academic ones. In 2004, 39.2% worked at academic hospitals and 55.1% worked at non-academic ones.

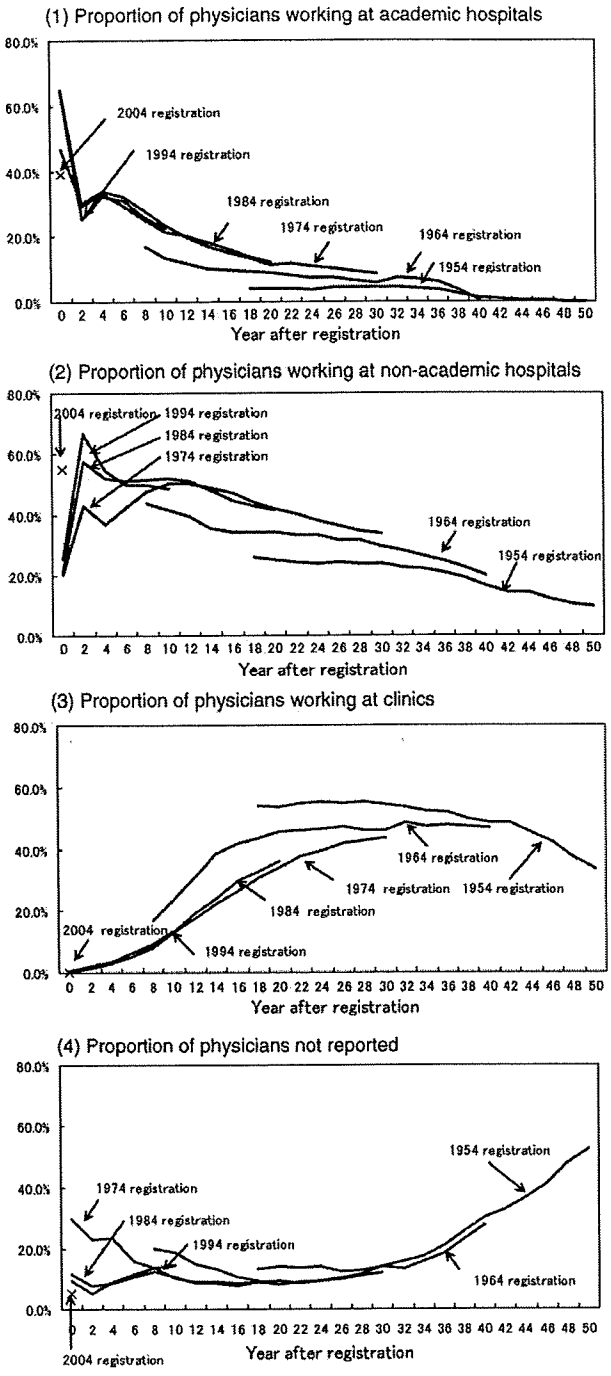

Fig. 1. Physicians' work places by registration year. (1) Proportion of physicians working at academic hospitals, (2) proportion of physicians working at non academic hospitals, (3) Proportion of physicians working at clinics, (4) proportion of physicians not reported.

3.2. Physicians' transfers to/from academic hospitals, non-academic hospitals and clinics

Fig. 2 presents the data for physicians' work place changes between facility types within the two survey periods (1992–1994 and 2002–2004).

Although the flow among facility types (non-academic hospitals to academic hospitals, academic hospitals

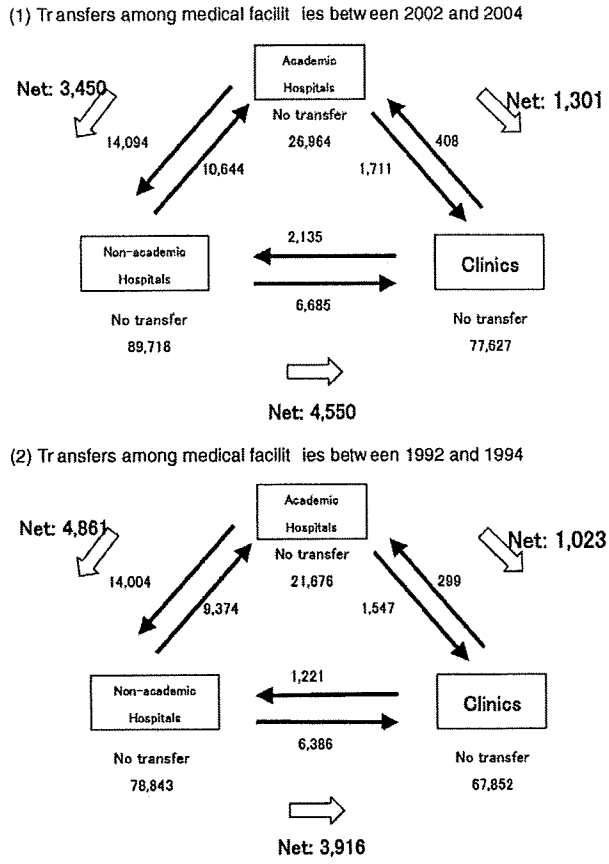

Fig. 2. Physicians' career transfers. (1) Transfers among medical facilities between 2002 and 2004, (2) transfers among medical facilities between 1992 and 1994.

from/to clinics, and non-academic hospital from/to clinics) increased from the 1992–1994 to the 2002–2004 survey period, the flow from academic to non-academic hospitals remained almost unchanged (14,004 to 14,094). This gap between inflow and outflow caused the net flow decrease from academic hospitals to hospitals of about 30% (from 4,861 to 3,450). The number of newly-registered physicians working at hospitals increased from 6,881 to 8,264.

3.3. Estimated numbers of physicians by facility type and categories of municipalities

Table 1 presents a future estimate of the number of physicians by facility type and categories of municipalities, and the total number of active physicians.

The number of physicians working at university hospitals is estimated to remain almost unchanged. The number of physicians in non-academic hospitals is estimated to increase slightly from 120,300 in 2004 to 127,200 in 2015, that is, by 5.8%. A 5–9% increase in each administrative category is expected.

By contrast, the estimated numbers of physicians working at clinics shows strong growth, from 93,000 in 2004 to 127,900 in 2016, an increase of 37.6%. In each administrative category, a 20–36% increase is expected. In villages and towns, a 20% increase is expected; the lowest increase among all categories.

Table 1
Estimation of the number of physicians.

	2006	2008	2010	2012	2014	2016
Academic hospitals	46.7	46.3	46.3	46.5	46.7	46.9
Non-academic hospitals	120.2	121.1	122.4	124.0	125.6	127.2
14 Big cities	31.2	31.5	31.8	32.1	32.5	32.8
Core cities	19.5	19.7	20.0	20.2	20.5	20.8
Other cities	56.9	57.2	57.8	58.5	59.2	59.9
Towns and village	12.5	12.7	12.9	13.2	13.4	13.7
Clinics	98.5	104.5	110.6	116.5	122.3	127.9
14 big cities	29.2	30.8	32.5	34.2	35.8	37.3
Core cities	13.9	14.9	15.9	16.9	17.9	18.9
Other cities	43.8	46.8	49.7	52.5	55.2	57.8
Towns and village	11.6	12.0	12.4	12.9	13.4	13.9
Others	11.5	12.1	12.5	13.0	13.4	13.9
Total	276.9	284.0	291.8	299.9	308.0	315.9

(Numbers in thousands)

Combining "non-academic hospitals" and "clinics", the number of physicians estimated by administrative categories in 2006 and 2016 are, respectively, 60,400 and 70,200 in 14 big cities, 33,400 and 39,700 in core cities, 100,800 and 117,700 in other cities, and 24,100 and 27,600 in villages and towns. The growth rate of the number of physicians shows a 14–19% increase.

Fig. 3 presents the percentages of physicians at academic hospitals, non-academic hospitals, and clinics relative to the total number of active physicians in each year (1972–2004 actual figures, 2006–2016 estimates). Recently, working in clinics has become a major trend in career choice in Japan. Physicians working at hospitals began to outnumber those working at clinics in the 1980s. The number of physicians working at hospitals continued to increase, but the growth rate slowed in the mid-1990s. As the number of physicians working at clinics continues to increase, in 2016, the percentage of physicians working at clinics is estimated to overtake the percentage of physicians working at hospitals.

4. Discussion

4.1. Our model for future projection

There are two major approaches to the physician supply and demand discussion. One is the approach from the physician supply side; the other is from the demand side [19]. In principle, our estimation model is a supply model similar to the Graduate Medical Education Advisory Committee and the HRSA-BHPr supply models. We used baseline year active physicians, added future graduates, and considered specialty switching and "not reported" based on past trends. We used a head count of reported physicians rather than full-time-equivalent actively practicing physicians. We did not consider foreign medical school graduates as the number is very small in Japan. A previous investigation by Asano et al used HRSA-BHP's demand approach, which estimates physicians based on historical trend. Since it is impossible to accurately project future ratios of physicians to patients [20], the demand and supply approaches

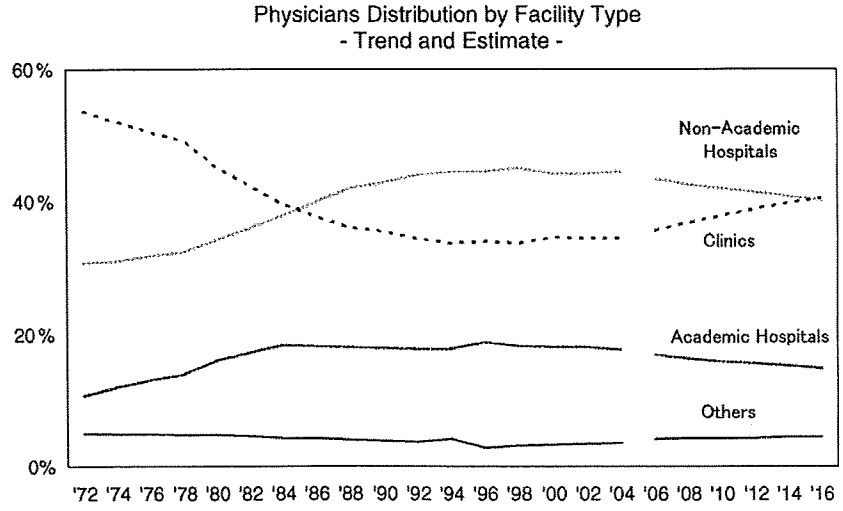

Fig. 3. Physicians distribution by facility type.

both use the same solution. However, our supply model, which assumes the current trends in physician supply will continue unchanged, can provide a reasonably true course for physician supply in Japan and thus should provide a basis for policy debate on the number and distribution of Japanese physicians.

4.2. Physicians' choice of facility type

Based on the results for physicians' career paths focused on facility types, we found differences among three groups; namely, physicians registered in 1954–1964, those registered in 1974–1994, and those registered in 2004. The first two groups tended to move gradually from academic hospitals to non-academic hospitals and then to clinics. More physicians registered in 1954–1964 worked at clinics and fewer at academic hospitals. This was a result of the increased number of medical schools and their graduates in the 1970s. Then, as a result of the introduction of a new post-graduate clinical training program, the majority of physicians registered in 2004 worked at hospitals in their year of registration, far exceeding the 20–25% level recorded by the previous generations.

4.3. Changes in the supply of physicians from academic hospitals to non-academic hospitals

In this study, we have observed a change in the supply pattern of physicians, especially those related to academic hospitals. Previously, academic hospitals were a major supplier of physicians to other major facilities, while non-academic hospitals supplied physicians to clinics. If this trend continues, it is predicted that the declining flow of physicians from academic hospitals to non-academic hospitals could have an impact on the distribution of Japan's health care human resources.

Our results also show that while the outflow of physicians from academic hospitals to non-academic hospitals and clinics remains unchanged, the increase of the inflow from other clinics and academic hospitals brought about a net decrease in the supply of physicians from academic and other hospitals. Given that the number of newly-registered physicians working at academic hospitals declined by 1883 from 7858 to 5975 during the same period, we cannot conclude that academic hospitals recruit physicians back from non-academic hospitals. Since the introduction of the new postgraduate clinical training system was installed, fewer new graduates go directly to academic hospitals. The gap is filled by accepting more physicians from non-academic hospitals.

Under the new post-graduate medical training system, a new career pattern for physicians has emerged. In the new system, medical students graduating from medical schools first join non-academic hospitals for post-graduate medical training, return to academic hospitals, then move back to non-academic hospitals, and then finally join clinics. Compared with the previous system, which was a virtual cascade from academic to non-academic hospitals and then to clinics, from the viewpoint of continuous education for physicians, this revolving-door type of career path will provide new career opportunities for physicians to update their knowledge and techniques in academic hospitals and apply them in non-academic hospitals, thus widening their career options through their experiences.

4.4. Future increases of clinic based physicians, its impact and possible policy implications

Our results show that the number of physicians continues to increase and that the rates for urban/rural areas remain similar. Therefore, the maldistribution of physicians in urban and rural areas will not improve. In addition, we have observed an obvious shift of physicians from hospitals to clinics.

To discuss the impact of physicians shifting from hospitals to clinics, it is important to consider the changing role of hospitals and clinics over time. As the National Surveys of Physicians, Dentists, and Pharmacists do not contain information on the function of hospitals and clinics, it is impossible to draw a direct implication from our study. However, the effect of medical advancement over time should be considered. With the advancement of medical technologies, clinics will be able to apply advanced techniques, which have previously only been used in hospitals. This notion is especially important because Japan is known for its well-equipped medical facilities [21]. This is true even in rural hospitals and clinics. [22]

Although the advancement of medical techniques and strengthening function of clinics will alleviate the potential risk of a weakening Japanese health care system, medical care services in hospitals are facing difficulties. Increasing numbers of lawsuits and distrust of physicians, together with sensational media reports, will accelerate the physician shortage and make the medical care system in Japan more fragile [23]. The Committee on Physicians' Demand and Supply at the MHLW described the difficult situation of hospital-based physicians as 'the more physicians work at hospitals, the less they are rewarded for it'. Furthermore, they have a higher exposure to the risk of lawsuits. Physicians at hospitals feel that their social standing has deteriorated and their work stress has increased. As a result, many physicians choose to leave hospitals. [24]

As this study focuses on the distribution of physicians in different facilities, a detailed analysis of the distribution of specialties was not conducted. Nowadays, the shortage of physicians and the distribution of specialties draws unprecedented attention in Japan. There are fewer newly registered Obstetrician/Gynecologists (OB/GY) practitioners. As a result, the number of medical facilities for child delivery is decreasing in Japan. The OB/GY specialty has largely been left to internists [25]. Pediatricians are also in a difficult situation. Young pediatricians are leaving their specialties earlier than previous generations [26].

Therefore, strong policy intervention appears necessary to maintain the Japanese health care system. A long-term strategy to invest and revitalize the health care system, especially for hospitals and rural areas, should be considered to tackle these problems.

4.5. Some limitations of this research

This research is subject to certain limitations. First, "not reported" physicians may influence the estimates and analyses of physicians' moves during the two survey periods. The ratio of reported physicians in the Survey of Physicians, Dentists, and Pharmacists is known to be over 90% [27]. Second, with regard to the analysis of the transfers among medical facilities, as we have analyzed only two periods (2002–2004 and 1992–1994 periods), temporal trends in the particular period might affect the interpretation of the results because of selection bias. Third, a key assumption in using the Multistate Life Table for future estimates of physicians is that the probability of changing career status after each year of experience will continue in a consistent manner. However, as a result of the introduction of the new clinical training system in 2004, many newly-registered physicians started their career at hospitals instead of academic hospitals. Changes in career paths as a result of further possible system changes could affect future estimates. For this reason, we set a relatively short estimation period of up to 2016 in the present study.

5. Conclusions

This study focused on the changes in physicians' career paths and their distribution by facility type and municipality type. We have presented recent physicians' career path changes as altering from a one-way career path to a revolving door career path. We also presented an estimate of the future numbers of physicians by using the Multistate Life Table. The distribution of physicians will change as physicians continue to shift from hospitals to clinics.

It is important to discuss the appropriate sharing of roles, responsibilities, and cooperation among medical facilities in line with the observed changes of career path and physician distribution. More emphasis should be placed on policies focused on hospitals in rural areas, and measures to provide incentives to physicians working in hospitals should be enacted.

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Estimation of physician supply by specialty and the distribution impact of increasing female physicians in Japan

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Abstract

Background: Japan has experienced two large changes which affect the supply and distribution of physicians. They are increases in medical school enrollment capacity and in the proportion of female physicians. The purpose of this study is to estimate the future supply of physicians by specialty and to predict the associated impact of increased female physicians, as well as to discuss the possible policy implications.

Methods: Based on data from the 2004 and 2006 National Survey of Physicians, Dentists and Pharmacists, we estimated the future supply of physicians by specialty, using multistate life tables. Based on possible scenarios of the future increase in female physicians, we also estimated the supply of physicians by specialty.

Results: Even if Japan's current medical school enrollment capacity is maintained in subsequent years, the number of physicians per 1000 population is expected to increase from 2.2 in 2006 to 3.2 in 2036, which is a 46% increase from the current level. The numbers of obstetrician/gynecologists (OB/GYNs) and surgeons are expected to temporarily decline from their current level, whereas the number of OB/GYNs per 1000 births will still increase because of the declining number of births. The number of surgeons per 1000 population, even with the decreasing population, will decline temporarily over the next few years. If the percentage of female physicians continues to increase, the overall number of physicians will not be significantly affected, but in specialties with current very low female physician participation rates, such as surgery, the total number of physicians is expected to decline significantly.

Conclusion: At the current medical school enrollment capacity, the number of physicians per population is expected to continue to increase because of the skewed age distribution of physicians and the declining population in Japan. However, with changes in young physicians' choices of medical specialties and as the percentage of female physicians increases, patterns of physician supply will vary between specialties. Specialties less often chosen by young physicians and where males have dominated will face a decline in physician supply. These results highlight the necessity for developing a work environment that attracts female physicians to these types of specialties. This will also lead to improved gender equality in the workforce and more effective use of human resources.

Background

Since training new physicians is a long process and requires significant resources from both taxpayers and physicians themselves, one of the most common health policy issues faced throughout the world is matching physician supply with the needs and preferences of the population. Estimating the future physician supply provides an evidence basis for appropriate health policy. For this purpose, transitions in a society's healthcare policies and transitions in physicians' workplace preferences, as well as the demographics of the physicians themselves, should be taken into account. Therefore, a country analysis of these factors can provide useful information as a discussion base for health policymakers worldwide.

In Japan, there have been three significant changes affecting physician supply and distribution in recent years. They are: 1) a change in the post-graduate clinical training system; 2) an increase in medical school enrollment capacity; and 3) an increase in the percentage of female physicians.

The first change came with the introduction of the new post-graduate clinical training system in 2004. The new system shifted new graduates from academic hospitals to non-academic hospitals. In 2001, before the introduction of the new system, 70% of clinical trainees were receiving their clinical training at academic hospitals. About 40% of clinical trainees were receiving their training in a particular specialized field at an institution affiliated with their medical school. The distribution of physicians changed significantly in 2004 when the new system was introduced. Under this system, a matching system was introduced at the national level to match applicants' priority lists for training facility choices and the training facilities' lists of preferred candidate and available resident positions. As more non-academic hospitals offered training positions, the number of clinical trainees at academic hospitals dropped below 50%.

The second change was the increase in medical school enrollment capacity. The number of physicians per 1000 population was 1.1 in 1970, which was low compared with other developed countries. In 1970, the country's total first-year medical school capacity was 4,380. Then the government set the target number of physicians at 1.5 per 1000 population. This led to the establishment of a number of new medical schools, and in 1985 the enrollment capacity reached a peak of 8,340. After the target physician number was reached, the "Committee for the Future Supply-Demand of Physicians" recommended in 1986 that the number of new physicians be reduced by at least 10%, and subsequently the number of new physicians began to decline [1]. In 2008, the Committee for Studying the Realization of the Desired Medical Care System released their Interim Report. The committee recommended an increase in the number of new physicians in Japan. The report emphasized to the government that "the number of new physicians produced in the next fiscal year (2009) must surpass the past highest medical school enrollment capacity (8,360) and ... should be increased by about 50% in the future" [2]. Subsequently, in the 2009 fiscal year, the medical school enrollment capacity was set to 8,486, which is the highest level ever.

The third significant change was the increase in the proportion and the number of female physicians. The percentage of female physicians in the workforce rose from 9.8% in 1975 to 17.2% in 2008. Female medical students now account for over 30% of the total number of physicians who pass the national examination. This indicates that a proper discussion of physician supply and the gender composition of medical specialties needs to focus more on female physicians' preferences and career patterns.

Since the introduction of the new clinical training system in 2004, various studies and reviews have been published on the status of physicians who have recently completed their initial clinical training [3,4]. A provisional estimation of the supply and demand of physicians has recently been presented at a national review committee meeting [5]. Regarding the impact of the increased number of female physicians, the results of an analysis on the recent status of the number of female physicians and the employment rate of female physicians are available [6]. However, a detailed analysis and comparison by gender and types of medical specialties has not yet been carried out. The purpose of this study is to estimate the future supply of physicians and their distribution among specialties, by focusing on the increase in medical student enrollment capacity and the increase in female physicians, and to discuss the related policy implications. Our results can provide a wider research base for policy discussion in other countries.

Methods

For this study, we used data from the 1996 through 2006 data of the National Survey of Physicians, Dentists and Pharmacists, supplied by the Ministry of Health, Labour and Welfare, Japan. The National Physicians' Law requires all physicians to report their status every two years. The data included the physician registration number, gender, age, workplace municipality code, and self-designated specialty. The survey asks for the physicians' self-designated specialty and not their board/certified specialty. This point needs to be considered when interpreting our data. The relationship between a physician's self-designated specialty and board certification varies, and they are not necessarily the same. For example, whereas the number of self-designated pediatricians (14,700 as of the end of 2006) is similar to the number of board-certified pediatricians (12,354 as of March 2008), the number of