

子宮頸細胞抹片與人類乳突病毒 DNA 檢測應用於台灣子宮頸癌篩檢 之成本效益分析

Cost-Effectiveness Analysis of Cervical Cancer Screening with Pap Smear and Human Papillomavirus DNA Testing in Taiwan

中文摘要

台灣是女性子宮頸癌高發生率與高死亡率的國家，如何有效預防子宮頸癌是目前台灣當前重要的公共衛生課題之一，子宮頸癌細胞抹片篩檢於子宮頸癌的防治向來扮演著重要的角色。自從美國食品藥品管理局於 2003 年正式通過人類乳突病毒檢測與子宮頸細胞抹片可合併使用於 30 歲以上婦女子宮頸癌篩檢，諸多國外子宮頸癌篩檢的經濟評估報告亦顯示此合併篩檢之策略較目前篩檢策略具成本效益。因此，本研究旨在於評估子宮頸細胞抹片與人類乳突病毒 DNA 檢測應用於台灣子宮頸癌篩檢之成本效益。

本研究以社會觀點，使用修改成適用台灣子宮頸癌流行病學參數，並彙整篩檢工具之特性及相關成本，透過建構決策分析模式模擬 30 歲健康婦女實施子宮頸癌篩檢計畫長期之成本效果分析，追蹤其終生之品質調整後存活年數以及相關成本，評估沒有篩檢組分別與其他四個篩檢策略之差異成本效果比。主要四個篩檢策略分別為：一、每年例行性抹片檢查，並以抹片進行陽性個案追蹤。二、每年例行性抹片檢查，並以 HPV DNA 檢測進行追蹤。三、每三年例行性 HPV DNA 檢測，並以抹片進行追蹤。四、每五年例行 HPV DNA 檢測與子宮頸細胞抹片合併篩檢。本研究評估之效果指標是以子宮頸癌累積發生率、累積死亡率、平均餘命，以及品質調整後存活年數來評估，效果與成本使用 3% 折現比率來計算其現在的價值，並且將模式之參數進行單變項敏感度分析與機率性敏感度分析以了解結果之不確定性。

本研究推估實施子宮頸癌篩檢政策，四個篩檢策略可降低子宮頸癌之累積發生率 94.7% 至 98.7%、以及累積死亡率 95.4% 至 99.0%。研究結果發現篩檢策略以婦女每五年接受一次 HPV DNA 檢測與子宮頸細胞抹片合併篩檢所獲得之平均餘命為 48.97833 年最長(48.95905QALY)，而每年例行性抹片檢查，並以人類乳突病毒檢測作追蹤，或以抹片作追蹤，平均餘命分別為 48.97788 年(48.95113QALY)，以及 48.97785 年(48.94886QALY)次之，接著是每三年例行性人類乳突病毒檢測，並以抹片作追蹤，平均餘命為 48.97783 年再次之(48.95087QALY)。而折現後每人總成本分別為 NT\$38,027、NT\$19,350、NT\$17,981，以及 NT\$21,335，其差異成本效果比值為 NT\$529,086/QALY 至 NT\$1,002,480/QALY 間。單變項敏感度分析計算出不同類別的參數中以折現率之變動範圍最廣，可能導致研究結果方向之改變。若願付代價超過 NT\$1,200,000/QALY，則四個篩檢策略皆是可以被接受的篩檢策略。

評估台灣子宮頸癌篩檢政策，發現不論以人類乳突病毒檢測作追蹤、或主要篩檢工具、或用以合併篩檢，相較於沒有篩檢介入之策略，其差異成本效果比均低於世界衛生組織所建議之標準閾值。本研究結果顯示加入人類乳突病毒檢測是具有成本效益之篩檢策略。

英文摘要

Background: Cervical cancer is the leading cancer for women in Taiwan. The incidence and mortality rates are both high and therefore cause huge burden to the society. Long-term effectiveness of different cervical cancer screening tests and strategies is of necessity to be explored. Since 2003, U.S. Food and Drug Administration (FDA) has approved the Human Papillomavirus (HPV) DNA testing for women over 30 years of age and had abnormal Pap test results, to determine whether they need to be referred for further examination. HPV DNA testing can identify the high-risk viral types associated with the development of cervical cancer. Women with negative testing result may adapt longer screening interval. The present study was aimed to evaluate the long term cost-effectiveness of different strategies between HPV DNA testing combined with cervical cytology in cervical cancer screening policy in Taiwan among healthy women aged 30 years.

Methods: A decision analytic model was used to simulate the natural history of cervical cancer in Taiwan health care system. We adopted a societal perspective for the cost-effectiveness analysis to estimate the QALYs and lifetime costs per woman for four main screening strategies: 1) annual Pap smear screening, followed by repeat Pap smear, 2) annual Pap smear screening, using HPV DNA testing as a triage, 3) triennial HPV DNA testing, using Pap smear as a triage, 4) quinquennial combination Pap smear with HPV DNA testing. All strategies were compared with no screening in base case and screening until age 70 years. Outcomes included cumulative incidences and mortality of cervical cancer, life expectancy, quality-adjusted life expectancy, lifetime costs, and incremental cost-effectiveness ratio, expressed as cost per QALY. Future costs and life-years were discounted at an annual rate of 3%. One-way sensitivity analysis and probabilistic sensitivity analysis were performed.

Results: The model predicted that the four main screening strategies reduced the lifetime cervical cancer risk to 94.7% to 98.7%, and the lifetime cervical cancer mortality to 95.4% to 99.0%. Compared with Pap smear triage strategy, repeat Pap smear strategy increased life expectancy from 48.97783(48.95087 QALY) to 48.97785(48.94886 QALY). Compared with HPV triage strategy, combination Pap smear with HPV DNA testing increased life expectancy from 48.97788(48.95113 QALY) to 48.97833(48.95905 QALY). The discounted average total per-woman lifetime costs were NT\$ 21,334, NT\$17,981, NT\$19,350, NT\$38,027. Incremental

cost-effectiveness ratio for repeat Pap smear strategy, Pap smear triage strategy, HPV triage strategy were NT\$529,086/QALY, NT\$551,987/QALY and NT\$617,699/QALY, respectively. Whereas for combination Pap smear with HPV DNA testing was NT\$1,002,480. Results were most sensitive in discount rate, which would change the relative performance. If the willingness-to-pay thresholds consistently cost more than NT\$1,200,000/QALY, all four main screening strategies were preferred.

Conclusions: In comparison with no screening, adding HPV DNA testing screening strategies, which were all less than thresholds proposed in the World Health Organization, could be considered cost-effective in Taiwan.