2026년 대한부인종양학회
제31차 추계 심포지엄
2026.10. 23.(금) - 24.(토)
정부세종컨벤션센터
세종 코트야드 바이 메리어트

자궁경부암 예방 및 선별검사의 미래

Future of Cervical Cancer Prevention and Screening

www.sgo.or.kr



HPV vaccine, HPV-based screening, risk-based management

박준식

순천향대학교 부천병원

간호 세션 II – 부인암의 예방 및 스크리닝

DECLARATION OF INTERESTS

Nothing to declare

WHO Global Strategy to Eliminate Cervical Cancer

WHO 2030 Targets in low- and lower-middle-income countries



A vision of a world where cervical cancer is eliminated as a public health problem

WHO. Global strategy, 2020; Cervical Cancer Elimination Initiative.

WHO Global Strategy to Eliminate Cervical Cancer

WHO 2030 Targets in low- and lower-middle-income countries

90%

백신 접종

여아가 15세까지
HPV 백신 접종 완료

70%

HPV 기반 선별검사

35세까지, 45세까지 다시
고성능 검사로 선별검사

90%

적절한 치료 관리

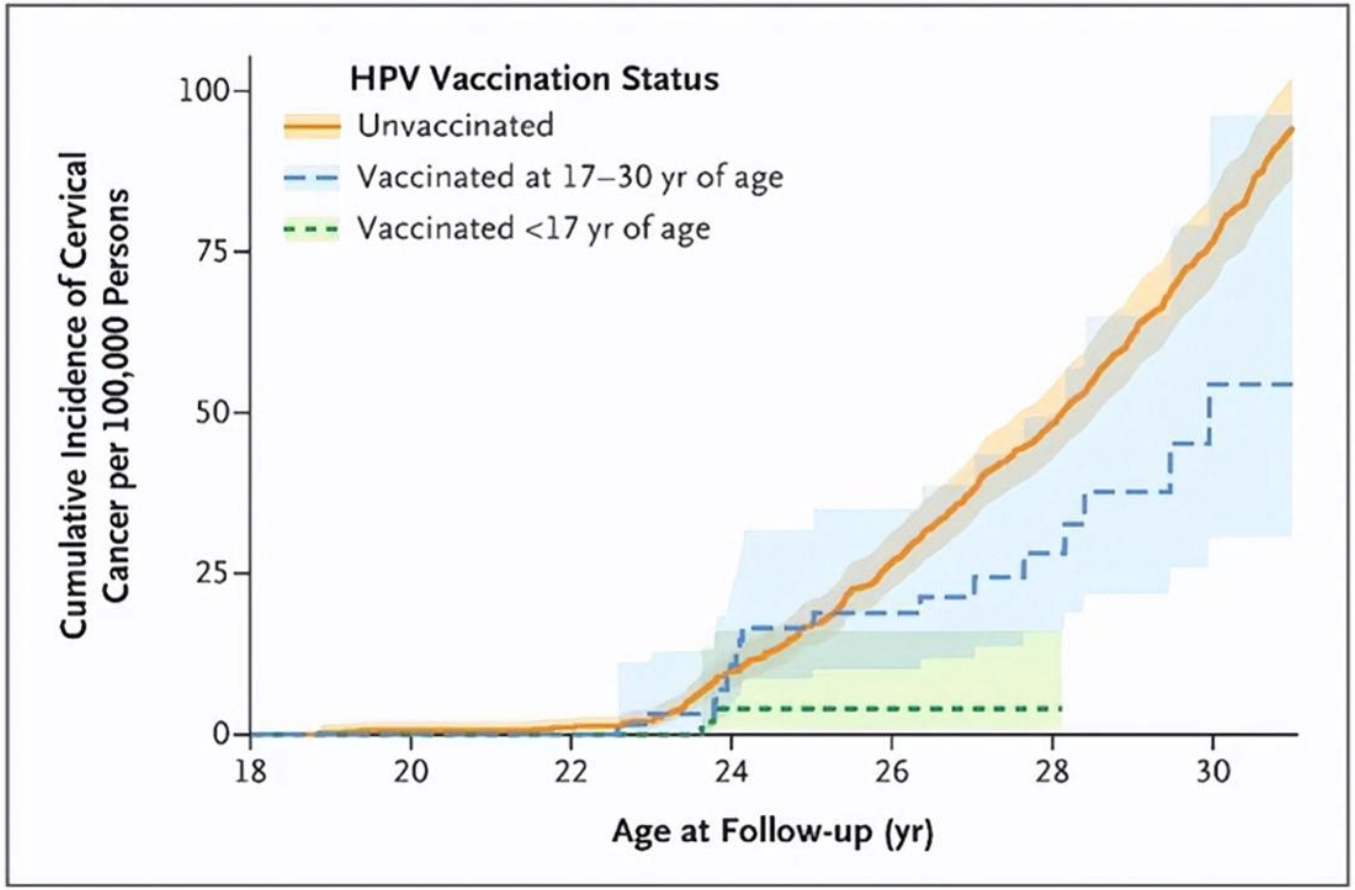
전암병변 치료 90%
침윤암 관리 90%

제거 기준: 연간 여성 10만 명당 발생 4명 미만
2030년은 제거 완료 시점이 아니라 90–70–90 달성 목표 시점

Median cervical cancer incidence is projected to fall by 42% by 2045 and 97% by 2120, averting more than 74 million new cases.

WHO. Global strategy, 2020; Cervical Cancer Elimination Initiative.

Cumulative incidence of invasive cervical cancer According to HPV vaccination status

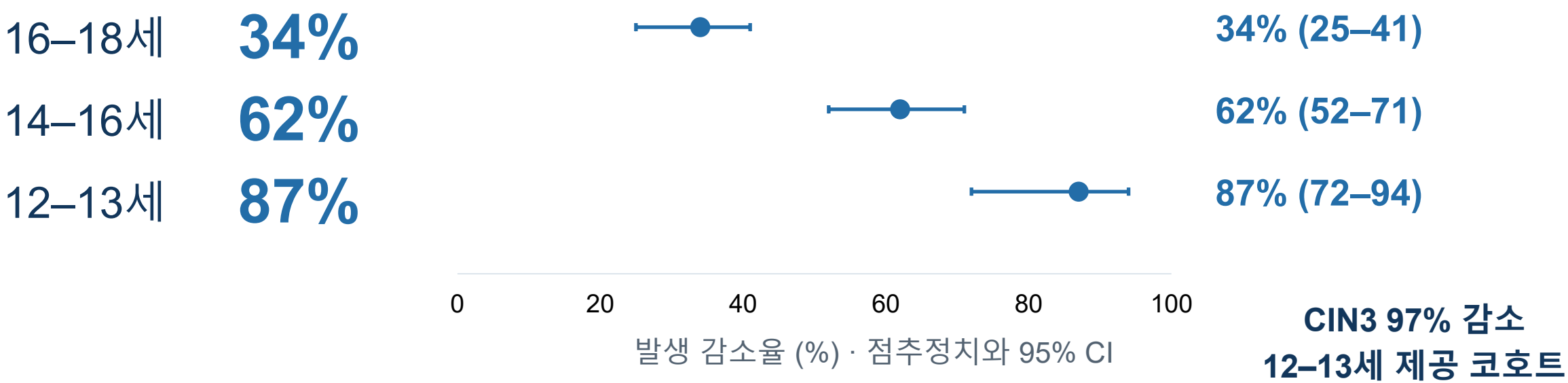


Lei et al, N Engl J Med. 2020 1;383(14):1340-1348

HPV 백신은 실제 암을 예방하는가?

영국 국가예방접종 사업 결과

자궁경부암 발생 감소



CIN3 97% 감소
12–13세 제공 코호트

Figure. 백신 제공 연령별 자궁경부암 발생 감소율과 95% CI

HPV 백신의 효과는 실제 자궁경부암 발생 감소로 이어진다.

Data from Falcaro M et al. Lancet. 2021;398:2084–2092. doi:10.1016/S0140-6736(21)02178-4

World Health Organization

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Home / News / One-dose Human Papillomavirus (HPV) vaccine offers solid protection against cervical cancer

One-dose Human Papillomavirus (HPV) vaccine offers solid protection against cervical cancer

11 April 2022 | News release | Reading time: 3 min (788 words)

The 4-7 April convening of the WHO Strategic Advisory Group of Experts on Immunization (SAGE) evaluated the evidence that has been emerging over past years that single-dose schedules provide comparable efficacy to the two or three-dose regimens.

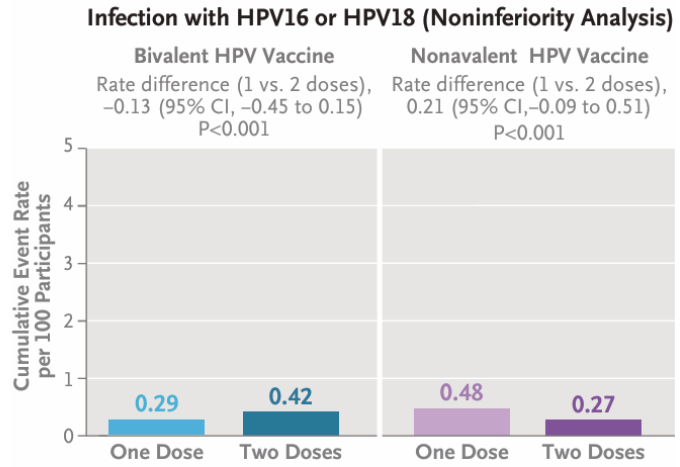
SAGE's review concluded that a single-dose Human Papillomavirus (HPV) vaccine delivers solid protection against HPV, the virus that causes cervical cancer, that is comparable to 2-dose schedules. This could be a game-changer for the prevention of the disease; seeing more doses of the life-saving jab reach more girls.

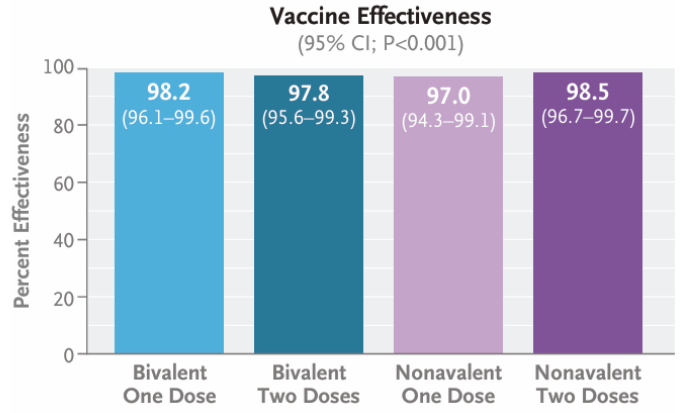
Related

Vaccines and immunization

Cervical cancer

Global strategy to accelerate the elimination of cervical cancer as a public health problem (who.int)





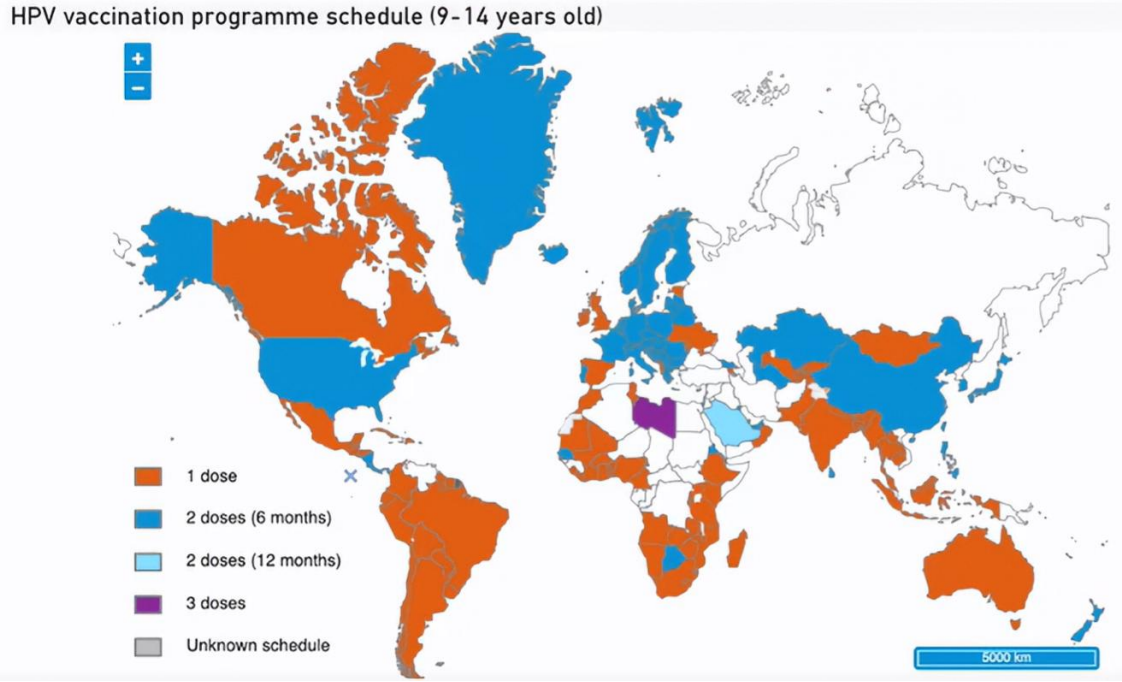
One dose of HPV vaccine provided protection against HPV16 or HPV18 infection that was similar to that of the standard two dose series.

N Engl J Med. 2025 18;393(24):2421-2433

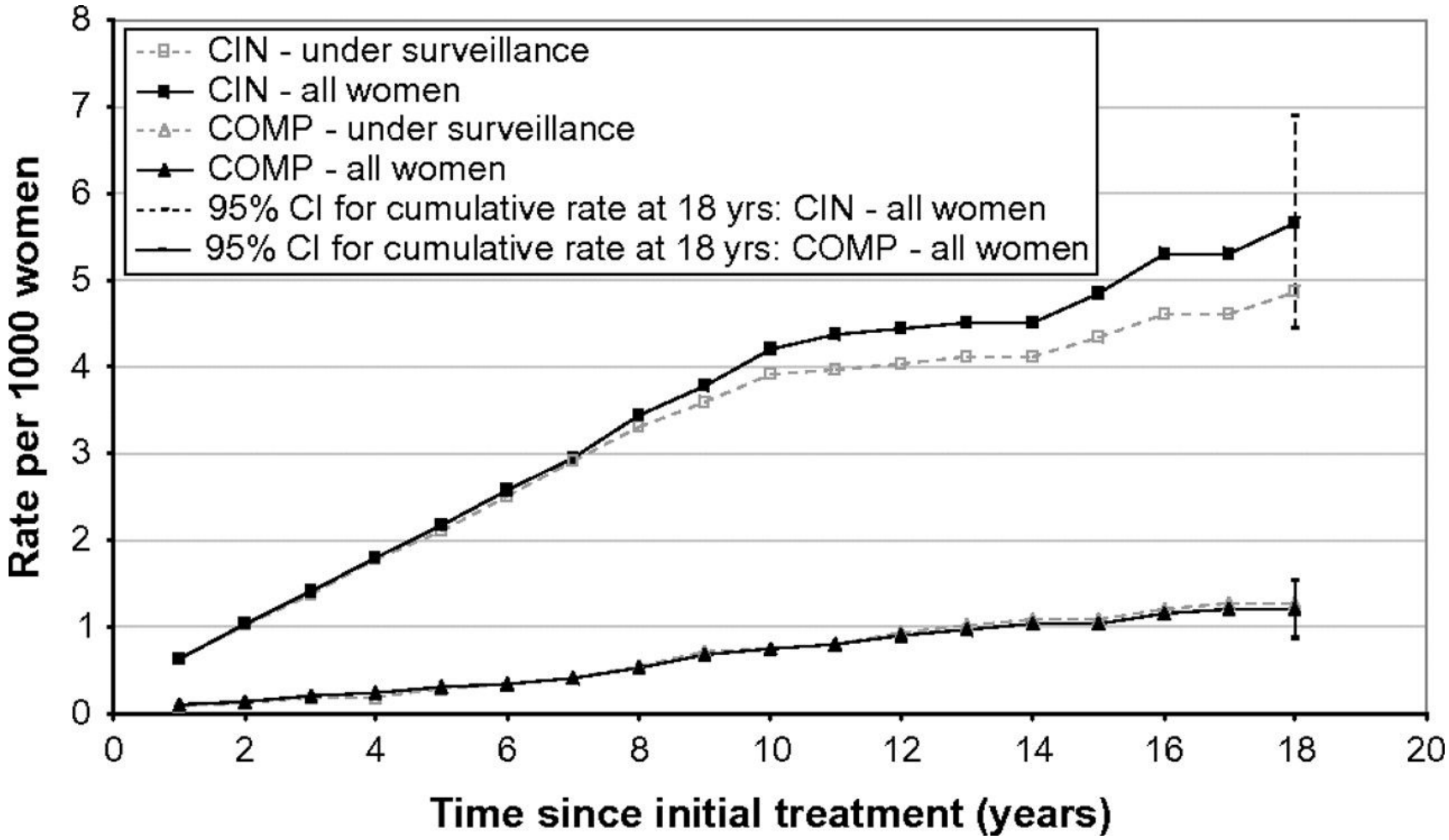
Limitations of single dose

- Duration of protection??
- No data on males!!
- Booster improves avidity and cellular immunity
  - No cross-protection
- Early vacciantion and high coverage key!
- No license for single dose (EMA, FDA!)
  - WHO recommendation
- ONE dose superior to NO dose!!!

96 countries single-dose (WHO dashboard)



Cumulative rates of invasive cervical cancer after CIN



Melnikow et al, J Natl Cancer Inst. 2009 20;101(10):721-8.

자궁경부암 선별 검사 패러다임의 변화

PAST

Cytology

세포 변화 발견

→

PRESENT

HPV-based Screening

원인 바이러스 검출

→

FUTURE

Risk-based Precision Prevention

위험도에 맞춘 예방

Self-sampling
접근성

Biomarker
위험 구분

AI
검증 중인 보조 기술

Therapeutic vaccine
치료 확장 연구

기존 검사를 대체하기보다, 접근성과 위험 예측 정보를 보완

Detection에서 Prediction으로, 발견에 위험 예측을 더한다.

Concept adapted from WHO 2021; Perkins et al. 2020; ASCCP Enduring Guidelines.

현재의 자궁경부암 선별검사 전략

전략	장점	한계
Cytology	높은 특이도 축적된 경험	낮은 민감도 판독 편차
HPV test	높은 민감도 음성 후 낮은 위험	위양성 증가
Co-testing	높은 음성예측도	검사량·비용 증가

Global Trend

WHO: Primary HPV screening preferred

US: Primary HPV screening accepted

ASCCP

HPV 중심 위험도 관리

검사 선택과 양성 후 관리를 함께 설계해야 한다.

WHO. Screening guideline, 2021; Perkins RB et al. J Low Genit Tract Dis. 2020;24:102–131.

왜 HPV Primary Screening인가?

HPV-based *vs* cytology-based screening: 유럽 4개 무작위시험 통합 추적연구

0.60

침윤암 발생 상대 위험도

95% CI 0.40–0.89

40% Lower Risk of Invasive Cervical Cancer

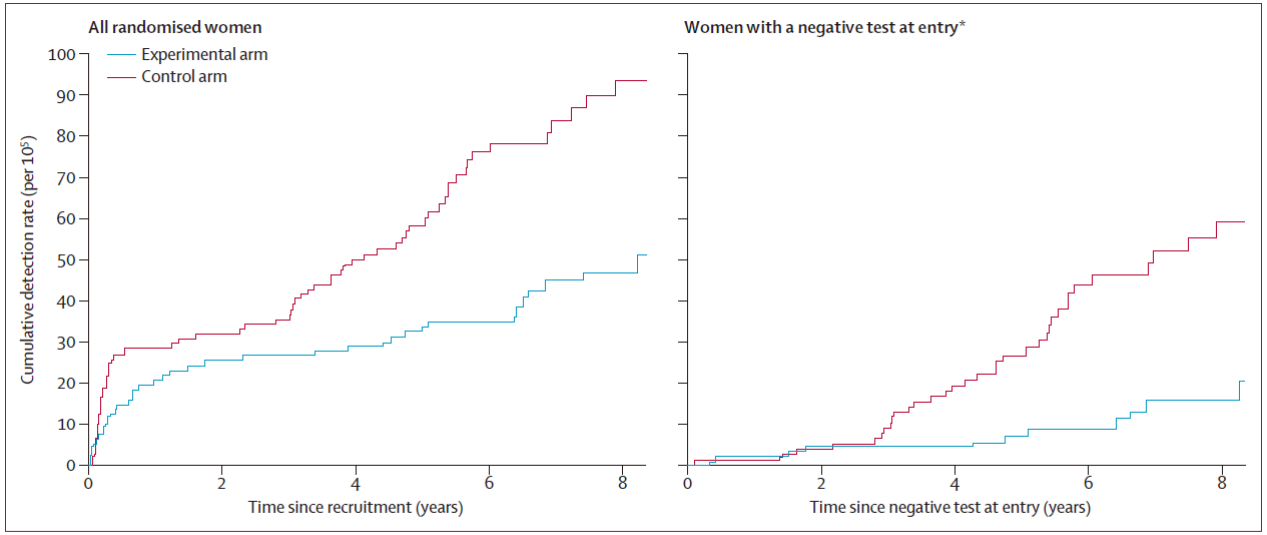


Figure 2: Cumulative detection of invasive cervical carcinoma
*Observations are censored 2·5 years after CIN2 or CIN3 detection, if any.

음성 후 낮은 위험은 더 긴 검진 간격의 근거

Figure. 침윤암 발생비와 95% CI, HPV 기반 / 세포검사 기반

HPV 기반 선별검사는 세포검사 기반 전략보다 침윤암에 대한 음성 예측도가 높다.

Data from Ronco G et al. Lancet. 2014;383:524–532. doi:10.1016/S0140-6736(13)62218-7

HPV 시대의 새로운 관리 패러다임

From Test Results to Risk Prediction

Past

Result-Based Management

Abnormal Result

↓

Management

Result-Based

Risk-Based

Present

Risk-Based Management

Current Test + Previous History

↓

Estimated CIN3+ Risk

↓

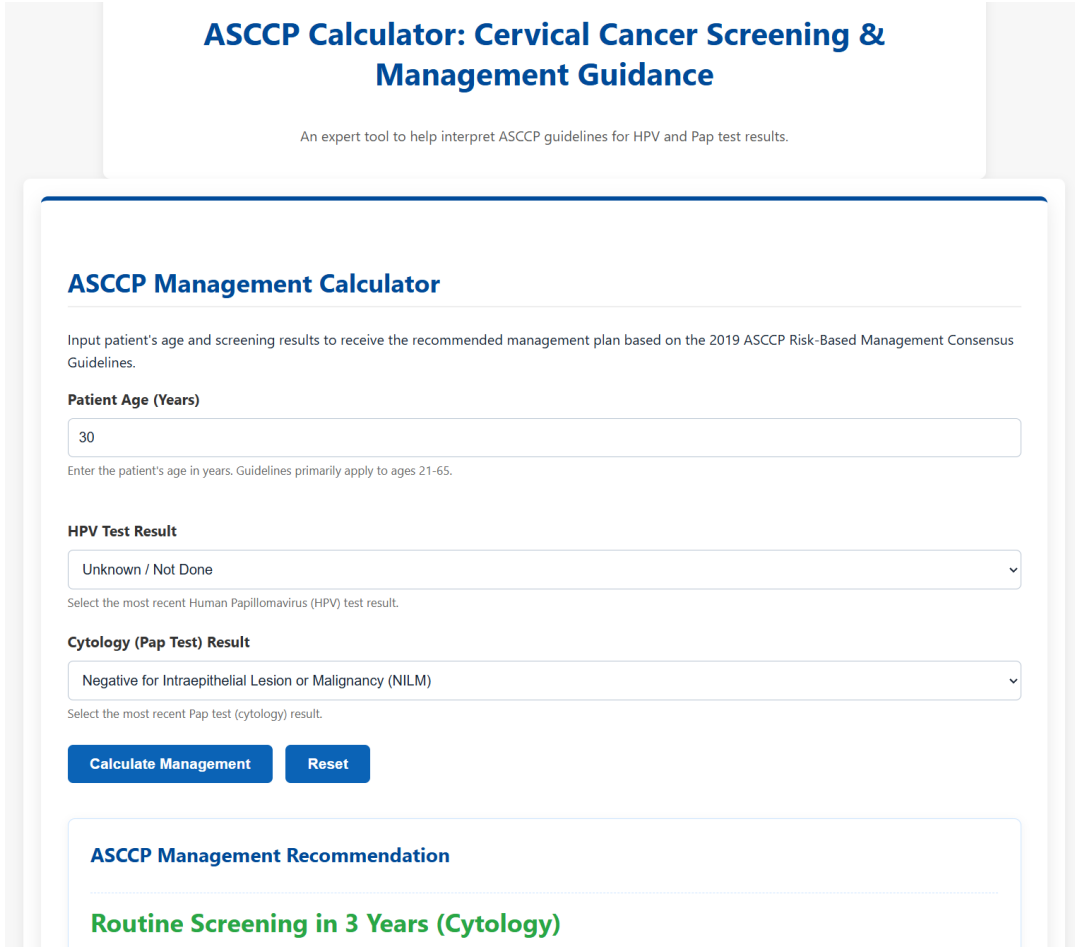
Management

Low Risk → Follow-up	Intermediate Risk → Colposcopy	High Risk → Treatment*

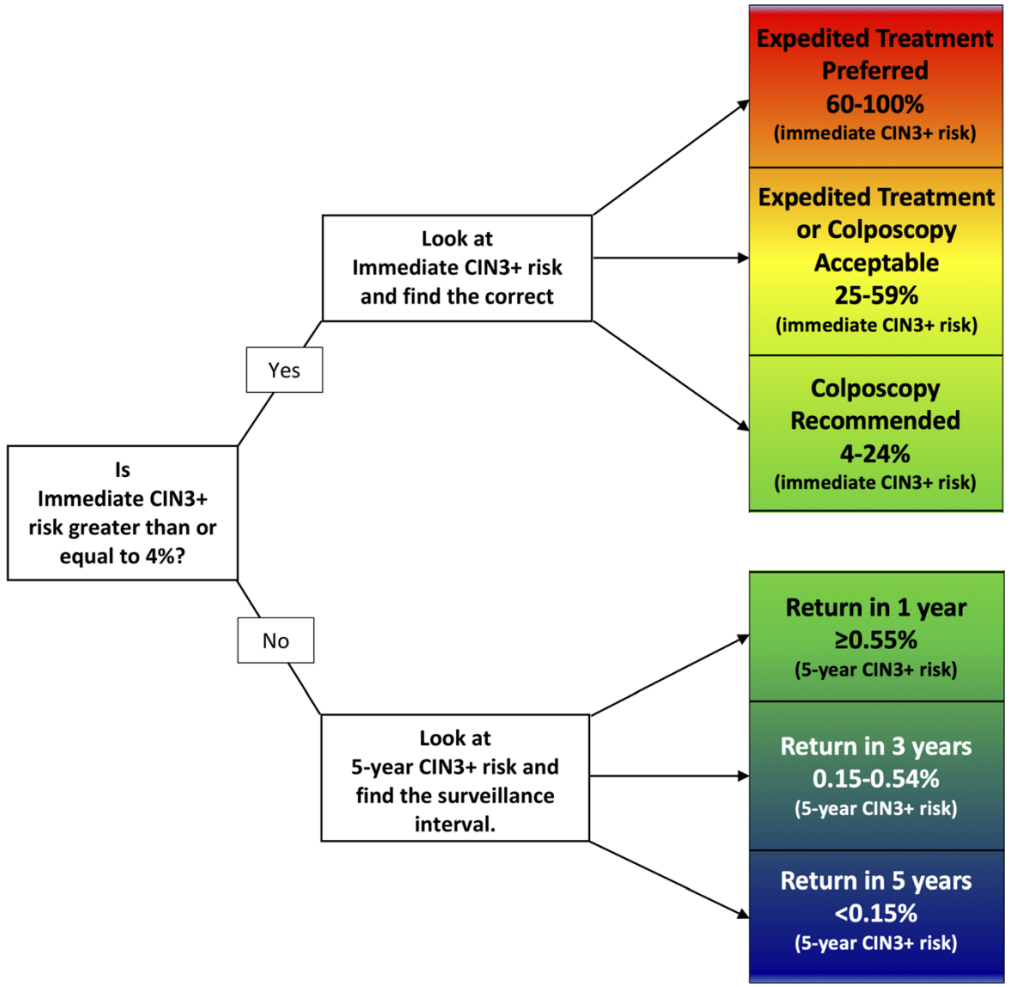
CIN 3+ risk: 5-year risk of CIN 3 or more severe diagnoses

같은 cytology 검사 결과라도 위험도(CIN3+ risk)에 따라 관리 전략이 달라진다.

Perkins RB et al. 2019 ASCCP Risk-Based Management Consensus Guidelines. J Low Genit Tract Dis. 2020;24:102–131.. doi:10.1097/LGT.0000000000000525.



https://everycalculators.com/asccp-calculator.html



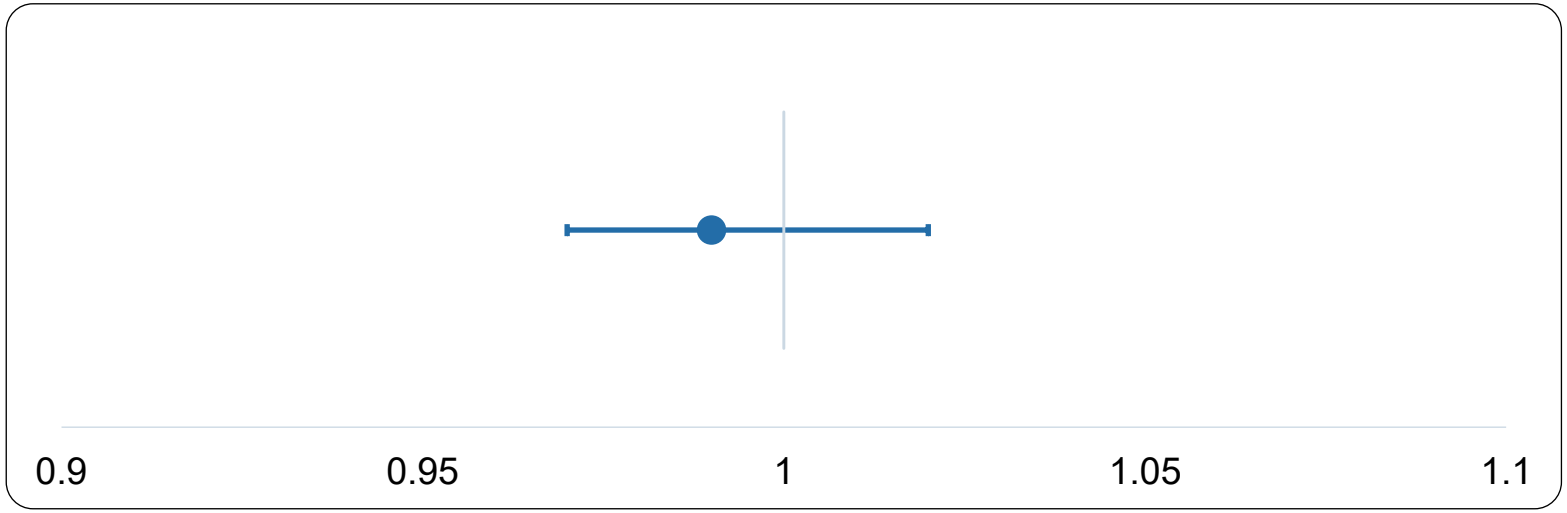
How patient risk is evaluated

Perkins RB et al. 2019 ASCCP Risk-Based Management Consensus Guidelines. J Low Genit Tract Dis. 2020;24:102–131.. doi:10.1097/LGT.0000000000000525.

검진에 오지 않는 여성을 어떻게 찾을 것인가?

Self-Sampling: Bringing Screening to Women

PCR-based HPV testing: relative sensitivity



Self sample / Clinician sample

1.0 = equal sensitivity

Data from Arbyn et al. BMJ 2018. Summary relative sensitivity and 95% CI.

PCR-based HPV Testing

Self Sample

≈

Clinician Sample

Equivalent Accuracy

Sensitivity Ratio

0.99

95% CI 0.97–1.02

Self-sampling does not sacrifice accuracy.

자가채취는 정확도를 희생하지 않는다.

Data from Arbyn M et al. BMJ. 2018;363:k4823. doi:10.1136/bmj.k4823

Self-Sampling은 참여율을 높인다

Access Matters

2.33×

Participation Increase

Home
↓
Self-Sampling Kit
↓
HPV Testing
↓
Screening Completion

Mail-to-All Strategy



vs. conventional invitation

Accessibility is prevention.

접근성 향상이 예방의 핵심이다.

Data from Arbyn M et al. BMJ. 2018;363:k4823. doi:10.1136/bmj.k4823

Precision Triage in HPV-positive Women

HPV 양성에서 위험층화로: p16/Ki-67 dual stain

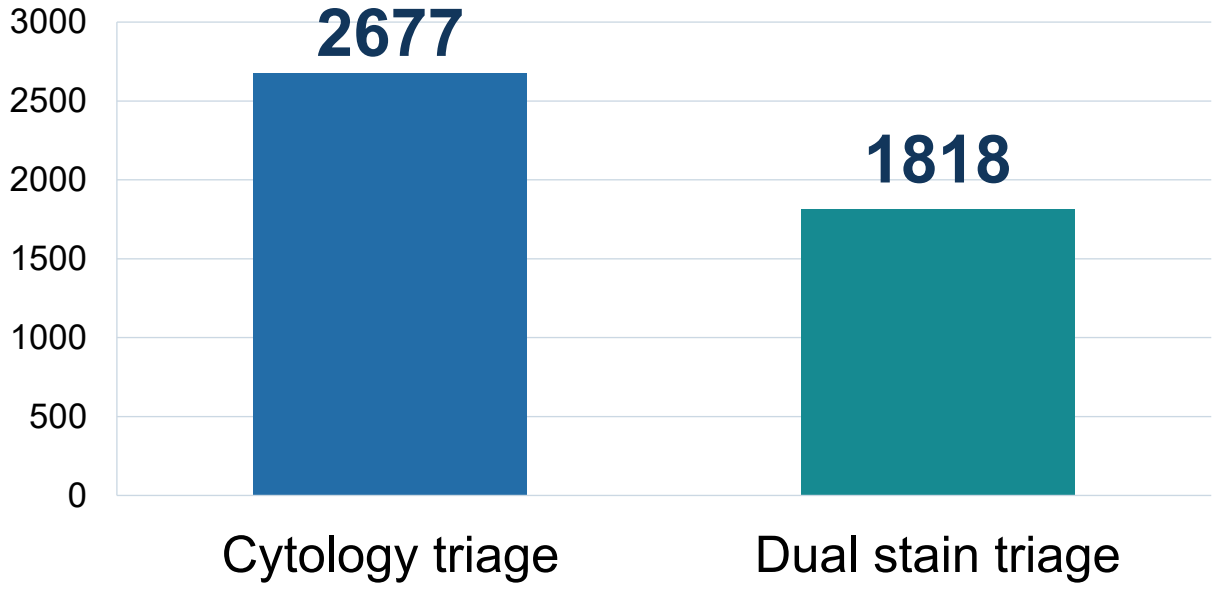


Figure. 연구 내 triage 전략별 질확대경검사 수

질확대경검사

32.1% 감소

Similar CIN3+ Detection
Fewer Colposcopies

HPV 양성 3,225명 코호트
비교 전략에 따른 결과

모든 HPV 양성 환자가 동일한 위험을 가지는 것은 아니다.

Data from Wentzensen N et al. JAMA Intern Med. 2019;179:881–888. doi:10.1001/jamainternmed.2019.0306

AI가 선별검사를 바꿀 수 있을까?

2019년 초기 성능과 2025년 저자 재평가

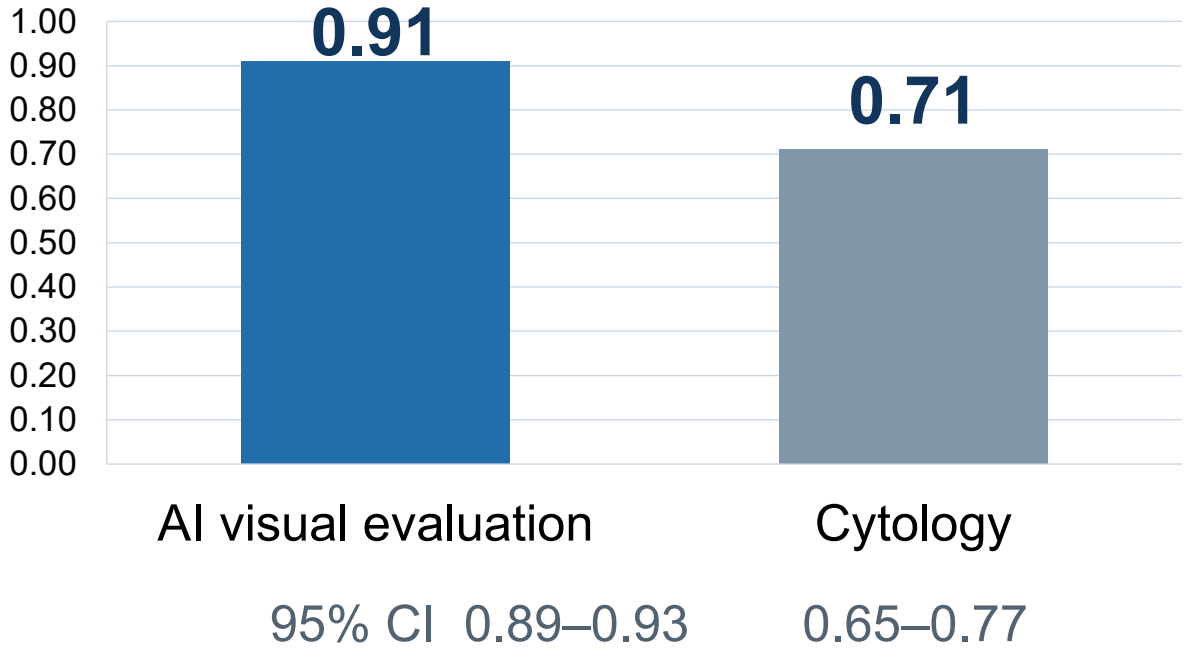
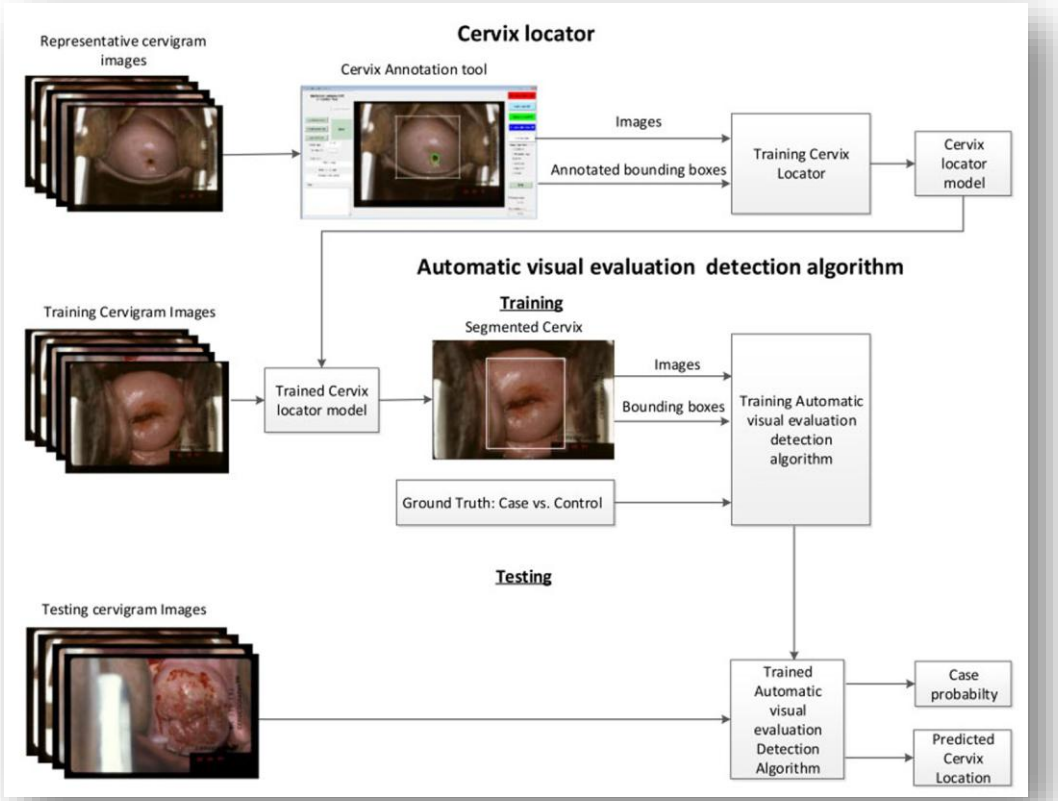


Figure. 누적 전암병변/암 검출 AUC (원 논문의 요약값)



External Validation Required

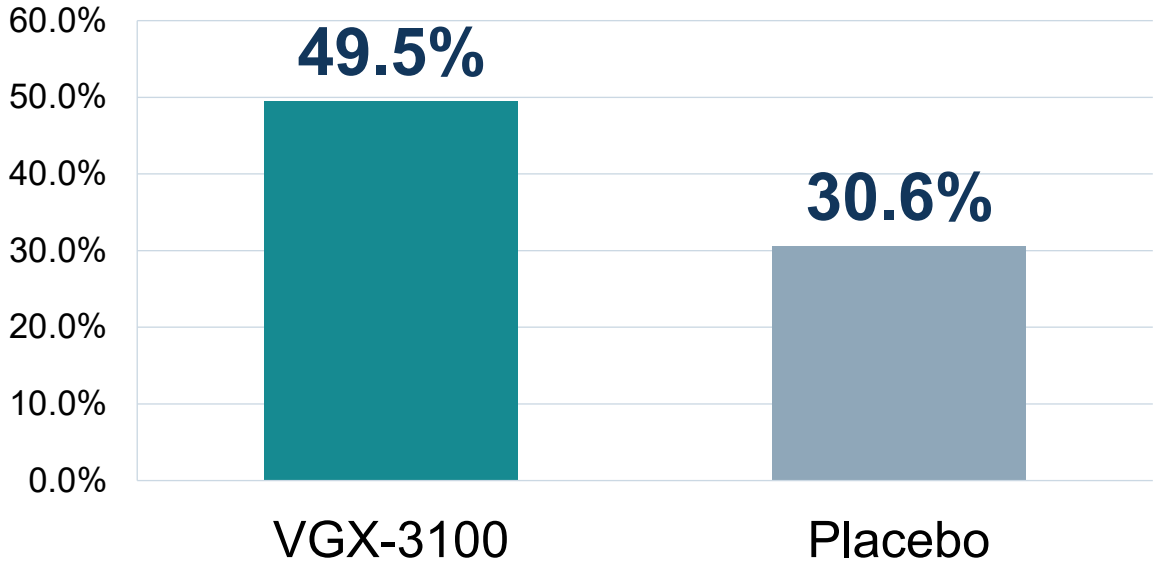
임상 적용 전 전향적 검증 필요

AUC 0.91의 초기 보고를 임상 현장의 성능으로 해석해서는 안 된다.

Hu L et al. JNCI. 2019;111:923–932; Schiffman M. JNCI. 2026;118:364–365 (online Dec 2025).

Therapeutic HPV Vaccine: Beyond Prevention, Toward Treatment

VGX-3100: HPV16/18 관련 CIN2/3의 무작위 2b상 시험



HPV16/18 관련 병변

CIN2/3

↓

E6/E7 표적

면역반응 유도

↓

병변 퇴행

36주 조직학적 평가

차이 19.0%p (95% CI 1.4–36.6)

Figure. 36주 CIN1 이하/정상으로의 퇴행, per-protocol 분석

치료용 HPV 백신은 유망한 연구 분야이며, 예방백신이나 표준 치료를 대체하지 않는다.

Data from Trimble CL et al. Lancet. 2015;386:2078–2088. doi:10.1016/S0140-6736(15)00239-1

미래의 통합 예방 모델

백신과 선별검사는 보완적 경로, triage는 조건에 따른 선택

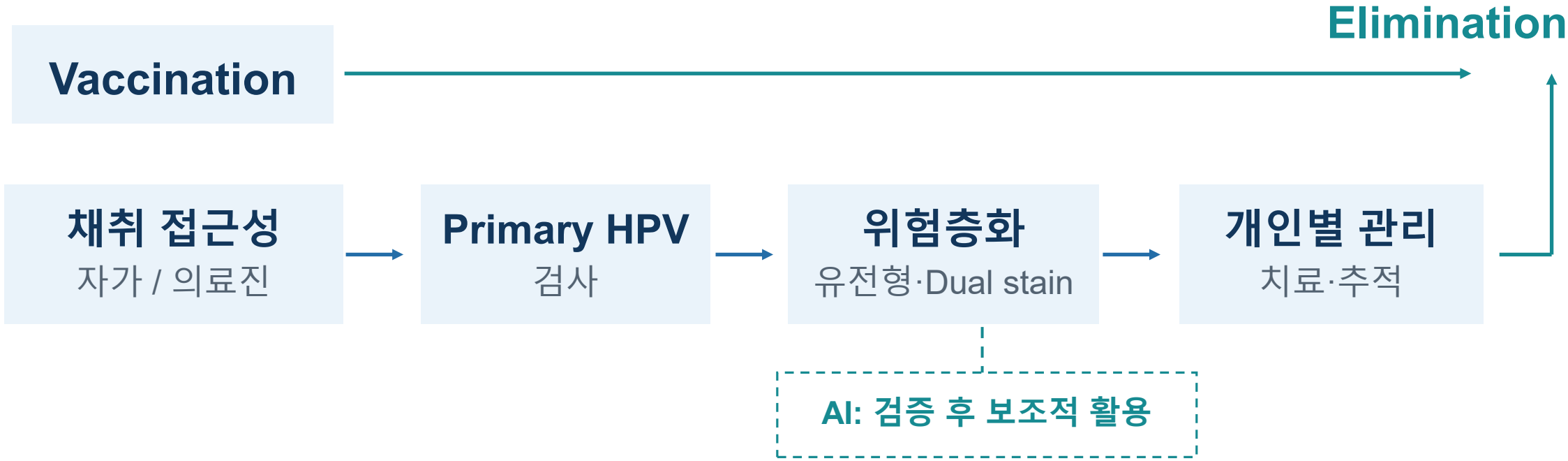


Figure. 미래 통합 모델의 개념도 · 자가채취, Dual stain, AI를 모두에게 필수인 순서로 적용하지 않음

백신과 선별검사를 넓히고, 위험에 맞는 관리로 치료·추적까지 연결한다.

Concept synthesis: WHO 2020; ASCCP Enduring Guidelines 2024–2026; Schiffman 2025/2026.

Take Home Messages

1 **HPV Vaccination Works**
Reduces cervical cancer incidence in real-world populations

2 **HPV-based Screening is the New Standard**
Stronger prevention evidence than cytology-based screening

3 **Risk Matters More Than Test Results**
Risk-based management is replacing result-based management

4 **Self-Sampling Expands Access**
Improves participation without sacrificing accuracy with validated PCR-based tests

5 **Precision Prevention Enables Elimination**
Biomarkers, AI, and therapeutic vaccines may complement HPV screening

↓ **WHO Elimination**

Vaccinate Earlier.

Screen Better.

Reach Everyone.

The future of cervical cancer prevention is not one technology.
It is the integration of vaccination, screening, risk stratification, and access to care.

Thank you

감사합니다

Future of Cervical Cancer Prevention and Screening

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