

Combined Evidence Statements from the evidence reviews to support the update of NICE guidance on Tuberculosis: clinical diagnosis and management of tuberculosis and measures for its prevention and control:

Review 1a: Interventions to promote BCG uptake; and

Review 1b: Review-level evidence on interventions to promote vaccination uptake

FINAL REPORT

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This combined summary document presents the evidence statements from two reviews commissioned by the NICE Centre for Public Health to support the development of updated guidance on tuberculosis. The first review (evidence statements marked 'a' below) covers primary studies on interventions to promote the uptake of BCG vaccination for tuberculosis. The second (evidence statements marked 'b') covers review-level evidence on interventions to promote any vaccination. These first two are organised by intervention type. The third set of evidence statements (marked 'c') reflects the same evidence, but has been organised by population, to summarize the evidence available for different groups, namely infants and children, new entrants, contacts fo cases and healthcare workers.

For full details of the scope, methods, and findings of the two reviews, and a complete bibliography of referenced studies, please refer to the separate review reports.

Evidence statement 1a: Staff training to increase BCG vaccination uptake

There is strong evidence from six studies (four UK^{1-3,5} and two from other countries^{4,6}) that interventions involving staff training may increase the uptake of BCG vaccination. One RCT¹ () shows significantly higher uptake in the intervention group, with an odds ratio of 9.52 (95% CI 4.0–22.7). Five BA studies showed some increase in uptake²⁻⁶ (6% before to 88-90% after³; ~15% before to 88% after⁴; 11% before to 14% after⁵; 25.4% before to 25.8% after⁶), although in only two cases was statistical significance measured, and in neither of these did the increase reach significance^{5,6}). The RCT¹ involved training clinical staff to identify people eligible for BCG vaccination, computer-based reminders to staff, and financial incentives to primary care practices for carrying out TB screening. The BA studies²⁻⁶ generally focused on staff training and did not use incentives.

Applicability

Most evidence is applicable to BCG vaccination in the UK. Four studies in this category (Athavale et al., 2006 (-); Gill and Scott, 1998 (-); Griffiths et al., 2007 (++)); Tseng et al., 1997 (-)) were carried out in the UK, and one (Romanus, 2005 (-)) in Sweden, which has broadly similar patterns of TB infection and BCG policy to the UK. One study (Uskun et al., 2008 (-)) was carried out in Turkey, which has a policy of universal neonatal BCG vaccination, and may be less applicable, although it is worth noting high incidence areas in the UK have universal neonatal vaccination policies.

¹ Griffiths et al., 2007 (++)

² Athavale et al., 2006 (-)

³ Gill and Scott, 1998 (-)

⁴ Romanus, 2005 (-)

⁵ Tseng et al., 1997 (-)

⁶ Uskun et al., 2008 (-)

Evidence statement 2a: Reminders to clinical staff to increase BCG vaccination uptake

One UK BA study¹ shows that computerised reminders to hospital staff can increase the uptake of BCG vaccination (18-24% before to 52/76% after¹). However, the data are difficult to interpret as the criteria for eligibility for BCG were defined differently at pre- and post-test.

Applicability

This evidence is directly applicable to BCG vaccination in the UK as the study was conducted in the UK.

¹ Chappel and Fernandes, 1996 (–)

Evidence statement 3a: Contact tracing interventions to increase BCG vaccination uptake

There is inconclusive evidence from one UK BA study¹ as to whether revised contact tracing protocols can increase the uptake of BCG vaccination.

Applicability

This evidence is directly applicable to BCG vaccination in the UK as the study was conducted in the UK.

¹ Ansari et al., 1998 (–)

Evidence statement 1b: Reminders and recall to increase uptake of vaccinations

There is strong evidence from seven reviews¹⁻⁷ ;;;;;; that recall and reminder interventions (general population 1.587 (1.14-1.75); children [*influenza*] 2.18 (1.29-3.70), [*routine vaccinations*] 1.47 (1.28-1.68); adults [*influenza*] 1.66(1.31-2.09), [*pneumococcus, tetanus, hep B*] 2.19(1.21-3.99) and adolescents 1.14 (0.98-1.31)²), including letters (*influenza and pneumococcus* 1.45 (1.30-1.61); 1.66(1.59-1.74)⁴), telephone calls (*influenza and pneumococcus* 2.74 (1.23-6.12); 2.86 (2.31-3.56)⁴); and text messages (*people travelling to high incidence countries* 1.19 (1.15-1.23)¹), are effective in increasing the uptake of a range of vaccinations. Three meta-analytic reviews^{2,3,5} show that these interventions have a medium to large effect size. There is evidence that these interventions are effective both for adults and older people (adults [*influenza*] 1.66(1.31-2.09), [*pneumococcus, tetanus, hep B*] 2.19(1.21-3.99)² older people 1.21 (0.99-1.48) [*tailored*] ; 1.53 (1.33-1.76)[*generic*]⁵ 2.74 (1.23-6.12)[*telephone influenza*]; 2.86 (2.31-3.56)[*telephone pneumococcal*]; 1.45 (1.30-1.61)[*print materials influenza*] 1.66(1.59-1.74)[*print materials pneumococcal*]⁴); and for parents of young children (2.18 (1.29-3.70), [*routine vaccinations*]²). There is some suggestion from one review⁶ that these interventions may be less effective in socio-economically disadvantaged populations.

Applicability

The majority of the evidence in these reviews appears to come from the USA, with only a small amount of evidence from the UK. There are no obvious limits to the applicability of this evidence,

although the different context of healthcare service organisation may affect the delivery of interventions.

- 1 Free et al., 2013 (++)
- 2 Jacobson Vann and Szilagyi, 2009 (++)
- 3 Lau et al., 2012 (++)
- 4 Ndiaye et al., 2005 (++)
- 5 Thomas et al., 2010b (++)
- 6 Tuckerman et al., 2009 (++)
- 7 Williams et al., 2011 (++)

Evidence statement 2b: Patient education to increase uptake of vaccinations

There is mixed evidence from five reviews¹⁻⁵ on the effectiveness of patient education interventions (other than reminders) in promoting the uptake of vaccination including posters in waiting rooms (*influenza* 1.78 (0.53-6.01); *pneumococcus* 1.92 (1.09-3.40)¹); brochures in offices (*influenza* 1.38 (0.82-2.33); *pneumococcus* 5.86 (3.29-10.44)¹); . One review () finds community media campaigns to be effective (*influenza* 3.16 (1.35-7.37); *pneumococcus* 1.31 (1.28-1.55)¹, with medium to large effect size. The findings on health education for patients or parents of young children are mixed.

Applicability

The majority of the evidence in these reviews appears to come from the USA, with only a small amount of evidence from the UK. This may limit the applicability of the findings, due to cultural or other differences.

- ¹ Lau et al., 2012 (++)
- ² Moxey et al., 2003 (-)
- ³ Ndiaye et al., 2005 (++)
- ⁴ Thomas et al., 2010b (++)
- ⁵ Tuckerman et al., 2009 (++)

Evidence statement 3b: Incentives or disincentives for patients to increase uptake of vaccinations

There is mixed evidence from five reviews on the effectiveness of incentives or disincentives for promoting the uptake of vaccinations¹⁻⁵. There is some evidence from two reviews that providing free vaccines is effective (1.98 (1.54-2.56)²; 5.43 (2.85-10.35)⁴). There is some evidence from two reviews (1.98 (1.54-2.56)²; 8.43 (3.95-18.0)³) suggesting that cash incentives may be effective. The evidence on conditional cash transfers¹ and penalties for welfare recipients⁵ is inconclusive.

Applicability

There are potential limits to the applicability of this evidence: for example the provision of free vaccines is of limited relevance to the UK context; the evidence on conditional cash transfers is from Mexico, a middle-income country; and the evidence on welfare penalties is from the USA, and may represent a different policy context.

- ¹ Lagarde et al., 2009 (+);
² Lau et al., 2012 (++);
³ Ndiaye et al., 2005 (++);
⁴ Thomas et al., 2010b (++);
⁵ Tuckerman et al., 2009 (++)

Evidence statement 4b: Home visiting and lay health worker interventions to increase uptake of vaccinations

There is strong evidence from four reviews¹⁻⁴ that home visiting and lay health worker interventions are effective in increasing the uptake of vaccination. Home visiting has been found to be effective for socio-economically disadvantaged parents^{1,2,4} (1.19 (1.09-1.30)¹; 1.23 (1.09-1.38)²; positive⁴) and for older people (1.30 (1.05-1.61)³), although effect sizes are small. However, there is evidence from three reviews^{4,5,6} that home visiting interventions are ineffective for parents who use drugs or alcohol (0.67 (0.33-1.35)⁵; 1.09 (0.91-1.32)⁶), and mixed evidence from one review⁷ for parents at risk for child abuse or neglect .

Applicability

The majority of the evidence in these reviews appears to come from the USA, with few or no studies from the UK. There may be limits to the applicability of this evidence resulting from the different cultural, policy or demographic contexts.

- ¹ Glenton et al., 2011 (++);
² Lewin et al., 2010 (+);
³ Thomas et al., 2010b (++);
⁴ Tuckerman et al., 2009 (++)
⁵ Kaufman et al., 2013 (++)
⁶ Turnbull and Osborn, 2012 (++)
⁷ Selph et al., 2013 (+)

Evidence statement 5b: Community engagement to increase uptake of vaccinations

There is strong evidence from two reviews^{1,2} that community engagement interventions, including outreach to at-risk groups and information or case management, are effective in increasing the uptake of vaccinations. These interventions appear to be effective for the general adult population (3.0 (1.28-7.03)¹) and for disadvantaged parents (positive findings²)

Applicability

The majority of the evidence in these reviews appears to come from the USA, with only a small amount of evidence from the UK. There may be limits to the applicability of this evidence resulting from the different cultural, policy or demographic contexts.

- ¹ Lau et al., 2012 (++);
² Tuckerman et al., 2009 (++)

Evidence statement 6b: Health checks and well-child clinics to increase uptake of vaccinations

There is mixed evidence from one review¹ () on the effectiveness of routine health checks in increasing vaccination uptake. There is medium evidence from one review² (positive direction of effect) that well-child clinics, i.e. specialist preventive services for parents of young children, are effective in increasing vaccination uptake.

Applicability

There is limited information on the country and context of the studies included in this category, and most appear to be in the USA. There may be limits to the applicability of this evidence to the UK resulting from the different contexts of health service delivery.

¹ Boulware et al., 2006 (++)

² Coker et al., 2013 (+)

Evidence statement 7b: school-based interventions to increase uptake of vaccinations

There is medium evidence from one review¹ (positive direction of effect) that policies requiring children to be vaccinated in order to attend school or day care is effective in increasing the uptake of childhood vaccinations. There is insufficient evidence on other school-based interventions.

Applicability

The majority of the evidence in this review appears to come from the USA, with no evidence from the UK. There may be limits to the applicability of this evidence to the UK resulting from the different contexts in terms of educational policy.

¹ Tuckerman et al., 2009 (++)

Evidence statement 8b: national vaccination programmes to increase uptake of vaccinations

There is medium evidence from one review¹ that national vaccination programmes, including policy changes and promotion and education campaigns, increase the uptake of childhood vaccinations.

Applicability

The evidence in this review comes from Australia and Finland, with no evidence from the UK. There may be limits to the applicability of this evidence due to the different cultural or policy contexts.

¹ Tuckerman et al., 2009 (++)

Evidence statement 9b: Reminders to clinicians to increase uptake of vaccinations

There is strong evidence from six reviews¹⁻⁶ (median +13.1% (IQR 12.2% to 20.7%)¹; 4.69 (1.25-17.53)²; 1.53 (1.26-18.5) [*influenza*] & 2.13 (1.50-3.03) [*pneumococcal*]³; median +17.9%⁴; median

+3.8% (IQR 0.5% to 6.6%)⁵; positive direction of effect⁶) that reminders to clinicians are effective in increasing vaccination uptake. However, two reviews report more mixed findings^{7,8}. Two meta-analytic reviews^{2,3} (4.69 (1.25-17.53)²; 1.53 (1.26-18.5) [*influenza*] & 2.13 (1.50-3.03) [*pneumococcal*]³) show medium to large effect sizes.

Applicability

The majority of the evidence in these reviews appears to come from the USA, with only a small amount of evidence from the UK. There may be limits to the applicability of this evidence due to the different contexts of health service delivery.

¹ Arditi et al., 2012 (+);

² Holt et al., 2012 (++);

³ Lau et al., 2012 (++);

⁴ Ndiaye et al., 2005 (++);

⁵ Shojania et al., 2011 (++);

⁶ Tuckerman et al., 2009 (++)

⁷ Souza et al., 2011 (++);

⁸ Thomas et al., 2010b (++)

Evidence statement 10b: Incentives and bonus payments to providers to increase uptake of vaccinations

There is medium evidence from six reviews¹⁻⁶ () that incentives and bonus payments to clinicians or practices, such as pay-for-performance schemes or payments per vaccination carried out, is likely to increase vaccination uptake. Two meta-analytic reviews^{3,5} (1.52 (1.20-1.93) [*influenza*] and 7.43 (2.25-24.53)[*pneumococcal*]³; 2.22 (1.77-2.77)[*older people*]⁵) find medium to large effect sizes.

Applicability

The majority of the evidence in these reviews appears to come from the USA, with only a small amount of evidence from the UK. There may be limits to the applicability of this evidence to the UK resulting from the different policy contexts and healthcare funding systems.

¹ Eijkenaar et al., 2013 (-);

² Houle et al., 2012 (+);

³ Lau et al., 2012 (++);

⁴ Scott et al., 2011 (+);

⁵ Thomas et al., 2010b (++);

⁶ Tuckerman et al., 2009 (++)

Evidence statement 11b: Clinician education to increase uptake of vaccinations

There is mixed evidence from five reviews¹⁻⁵ () regarding clinician education programmes to promote vaccination. Two reviews indicate that clinician education does not have a significant effect^{2,5} (), one indicates that it is effective ([infants] positive direction of effect⁴), and one shows mixed findings

([influenza] 0.99(0.94-1.04) and [pneumococcal] 1.54 (1.19-1.99)¹). One review (positive direction of effect³) indicates that facilitators working with clinical practices may be effective in increasing vaccination uptake.

Applicability

The majority of the evidence in these reviews appears to come from the USA, with only a small amount of evidence from the UK. There are no obvious limits to the applicability of this evidence.

¹ Lau et al., 2012 (++);

² Ndiaye et al., 2005 (++);

³ Thomas et al., 2010b (++);

⁴ Tuckerman et al., 2009 (++);

⁵ Williams et al., 2011 (++)

Evidence statement 12b: Audit and feedback to increase uptake of vaccinations

There is mixed evidence from 5 reviews¹⁻⁵ (1.83 (1.28-2.61) [*influenza*] and 1.18 (0.57-2.45) [*pneumococcal*]¹; 3.43 (2.37-4.97) [feedback with benchmarking]³; positive direction of effect^{2,4} and mixed finding⁵);) regarding the effectiveness of clinical audit and feedback interventions on the uptake of vaccination. Two reviews suggest that these interventions are effective^{2,4}, while the findings of the other three are mixed (1.83 (1.28-2.61) [*influenza: audit and feedback*] versus, 0.99 (0.94-1.04) [*influenza: continuous improvement*]¹; 3.43 (2.37-4.97) [feedback with benchmarking] versus, 0.77 (0.72-0.81) [educational outreach and feedback]³; mixed direction of effect⁵).

Applicability

The majority of the evidence in these reviews appears to come from the USA, with only a small amount of evidence from the UK. There may be limits to the applicability of this evidence resulting from the different contexts of clinical practice.

¹ Lau et al., 2012 (++);

² Ndiaye et al., 2005 (++);

³ Thomas et al., 2010b (++);

⁴ Tuckerman et al., 2009 (++);

⁵ Williams et al., 2011 (++)

Evidence statement 13b: Changes to service delivery models to increase uptake of vaccinations

There is strong evidence from three reviews¹⁻³ () that a range of changes to service delivery are effective in increasing vaccination uptake. One review (1.32 (1.14-1.52) [*influenza*] and 1.66 (1.59-1.74) [*pneumococcal*]¹) shows that delivering vaccination services in alternative sites (such as patients' homes or worksites or community pharmacies), and changing the team involved in delivering services (e.g. training nurses to give vaccinations) are both effective, with medium to large effect sizes. One review shows that group visits for people with chronic diseases are effective (2.44 (1.42-4.20) [*influenza*] and 2.25 (1.30-3.92) [*pneumococcal*]¹). One review finds mixed evidence for

case management (1.66 (0.81-3.43) [*influenza*] and 1.49 (1.05-2.13) [*pneumococcal*]¹). One review shows that increasing clinic accessibility (e.g. extended opening hours) in conjunction with education or reminders is effective². One review finds that opportunistic vaccination policies are effective in hospitals and prisons, but not in GP services³. The findings on hospital vaccination policies are mixed ((mixed direction)²; (positive findings)³).

Applicability

The majority of the evidence in these reviews appears to come from the USA, with only a small amount of evidence from the UK. There may be limits to the applicability of this evidence resulting from the different health system or demographic contexts.

¹ Lau et al., 2012 (++)

² Ndiaye et al., 2005 (++)

³ Tuckerman et al., 2009 (++)

Evidence statement 14b: Programmes to increase uptake of vaccinations among healthcare workers

There is mixed evidence from five reviews¹⁻⁵ regarding the effectiveness of multi-component interventions, generally combining education and changes to vaccination service delivery, to increase the uptake of vaccination among healthcare workers. These reviews find that although most studies show some positive direction of effect, in most cases it does not attain significance (Mixed findings¹; Positive findings²; Mixed findings (6/14 sig effective)[*education and access in hospitals*] & Positive findings (8/9 sig effective)[*education and access in other settings*]³; positive findings⁴; positive findings⁵).

Applicability

The evidence in these reviews appears to come from a range of countries, with relatively little evidence from the UK. There may be limits to the applicability of this evidence resulting from the differences in healthcare delivery and policy.

¹ Burls et al., 2006 (+)

² Jordan et al., 2004 (+)

³ Lam et al., 2010 (++)

⁴ Ndiaye et al., 2005 (++)

⁵ Thomas et al., 2010a (+)

Evidence statement 1c: Increasing uptake of BCG vaccinations in neonates

There is weak but relatively consistent evidence from four before and after studies¹⁻⁴ that clinician training interventions may be effective in increasing the uptake of BCG among neonates ((6% before to 88-90% after²; ~15% before to 88% after³; 11% before to 14% after⁴). There is weak evidence

from one before and after study⁵ that computer reminders to hospital staff may increase the uptake of BCG among neonates (18-24% before to 52-76% after⁵).

Applicability

All but one study (Romanus 2005) in this category were conducted in the UK and targeted increases in neonatal vaccination uptake within the current policy context.¹ Athavale et al., 2006 (-);

² Gill and Scott, 1998 (-);

³ Romanus, 2005 (-);

⁴ Tseng et al., 1997 (-)

⁵ Chappel and Fernandes, 1996 (-)

Evidence statement 2c: Increasing uptake of BCG and other vaccinations in infants and children

There is evidence from one before and after study¹ that clinician training interventions are ineffective in increasing the uptake of BCG among infants (25.4% cover before to 25.8% cover after¹ and odds ratio of 9.52 (95% CI 4.0–22.7)²). There is strong evidence from one meta-analytical systematic review that reminders to parents are significantly associated in increasing the uptake of vaccinations for infants and children (OR 2.18 (1.29-3.70) [influenza] and OR 1.47 (1.28-1.68) [routine childhood vaccinations]³), two non-meta-analytic reviews show somewhat more mixed findings^{4,5}. There is mixed evidence regarding parent education to increase the uptake of vaccination for infants and children^{4,5}. There is mixed and inconclusive evidence regarding welfare penalties in low income families⁵ and conditional cash transfers for parents⁶ to increase the uptake of vaccination for infants and children. There is strong evidence from three reviews that home visiting and lay health worker interventions targeted at disadvantaged or low-income families are effective in increasing the uptake of vaccinations for infants and children (RR 1.19 (1.09-1.30)⁷; RR 1.23 (1.09-1.38)⁸) however, there is evidence from three reviews that home visiting interventions are ineffective for parents who use drugs or alcohol^{5,9,10} (RR 0.67 (0.33-1.35)⁹; RR 1.09 (0.91-1.32)¹⁰), and mixed evidence from one review for parents at risk for child abuse or neglect¹¹. There is medium evidence from one review that community outreach programmes are effective in increasing the uptake of vaccinations for infants and children⁵. There is medium evidence from one review that well-child clinics, i.e. specialist preventive services for parents of young children, are effective in increasing the uptake of vaccinations for infants and children¹². There is medium evidence from one review that policies requiring children to be vaccinated in order to attend school or day care are effective in increasing the uptake of vaccinations for children⁵. There is medium evidence from one review that clinician education, and clinical audit and feedback, are effective in increasing the uptake of vaccinations for infants⁵.

Applicability

The one primary study in this category was conducted in Turkey, which has a policy of universal BCG vaccination, and so may not be applicable to areas of the UK where a universal vaccination policy is not in place. The review-level evidence comes from a range of countries and context and there may be some limits to applicability to the UK context as a result of different healthcare systems.

¹ Uskun et al., 2008 (-);

- ² Griffiths et al., 2007 (++);
- ³ Jacobsen-Vann and Szilagyi., 2009 (++);
- ⁴ Tuckerman et al., 2009 (++);
- ⁵ Williams et al., 2011 (++);
- ⁶ Lagarde et al., 2009 (+);
- ⁷ Glenton et al., 2011 (++);
- ⁸ Lewin et al., 2010 (+);
- ⁹ Kaufman et al., 2013 (++);
- ¹⁰ Turnbull and Osborn, 2012 (++)
- ¹¹ Selph et al., 2013 (+);
- ¹² Coker et al., 2013 (+)

Evidence statement 3c: Increasing uptake of BCG and other vaccinations in new entrants

There is strong evidence from one randomised control trial¹ that an intervention which involved training clinical staff to identify people eligible for BCG vaccination, computer-based reminders to staff, and financial incentives to primary care practices for carrying out TB screening, can increase the uptake of BCG vaccination(OR 9.52 (4.0–22.7)) in a population including a substantial proportion (around 14%) of immigrants .

Applicability

This study was conducted in the UK.

- ¹ Griffiths et al., 2007 (++)

Evidence statement 4c: Increasing uptake of BCG and other vaccinations in contacts of TB cases

There is inconclusive evidence from one BA study¹ as to whether revised contact tracing protocols can increase the uptake of BCG vaccination among contacts of TB cases.

Applicability

This study was conducted in the UK.

- ¹ Ansari et al., 1998 (–)

Evidence statement 5c: Increasing uptake of BCG and other vaccinations among healthcare workers

There is mixed evidence from five reviews¹⁻⁵ regarding the effectiveness of multi-component interventions, generally combining education and changes to vaccination service delivery, to increase the uptake of vaccination among healthcare workers. These reviews find that although most studies show some positive direction of effect (for example Mixed findings (6/14 sig eff)

[education & access in hospitals] and Positive findings (8/9 sig eff) [education & access in other settings]³, in most cases it does not attain significance^{1,2,4,5}.

Applicability

The evidence in these reviews appears to come from a range of countries, with relatively little evidence from the UK. There may be limits to the applicability of this evidence resulting from the differences in healthcare delivery and policy.

¹ Burls et al., 2006 (+);

² Jordan et al., 2004 (+);

³ Lam et al., 2010 (++);

⁴ Ndiaye et al., 2005 (++);

⁵ Thomas et al., 2010a (+)