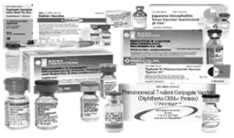

Best Practices: Immunization Strategies and Monitoring

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Immunization Strategies and Monitoring *Disclosures*

- Tracey Walsh-Chocolaad – None
- Maurice Alexander – None
- Cathryn Jennissen - None

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Immunization Strategies and Monitoring *Learning Objectives*

- Identify clinical pearls that may be useful to consider when developing a vaccine schedule for patients post-hematopoietic stem cell transplantation (HCT)
- Explain important controversies surrounding vaccine administration post-HCT and devise strategies to individualize care

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Immunization Strategies and Monitoring
Learning Objectives

- Describe perspectives on immunizations following adult HCT
- Describe perspectives on immunizations following pediatric HCT

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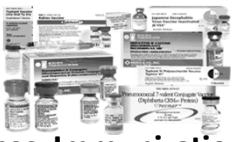

Best Practices: Immunization Strategies and Monitoring
Clinical Pearls & Controversies

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Immunization Strategies and Monitoring
Overview

- Clinical pearls
  - Monitoring for reactions following administration
  - Interference with vaccine response
    - — Administering vaccines together or spread out
    - — Blood products
    - — Medications
- Controversies
  - Thrombocytopenia or anticoagulation
  - Recent or current immunosuppressive therapy

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GUIDELINES

Guidelines for Preventing Infectious Complications among Hematopoietic Cell Transplantation Recipients: A Global Perspective

Marcie Tomblyn, Tom Chiller, Hermann Einsele, Ronald Gress, Kent Sepkowitz, Jan Storek, John R. Wingard, Jo-Anne H. Young, Michael A. Boeckh

Biol Blood Marrow Transplant 15: 1143-1238 (2009)

- Evidence-based
- Generalized to all HCT recipients
- IDSA published a limited update in 2014[1]

[1]*Rubin LG et al. Clin Infect Dis. 2014;*58:309-18 *IDSA=Infectious Diseases Society of America*

Immunization Strategies and Monitoring *U.S. Guidelines*

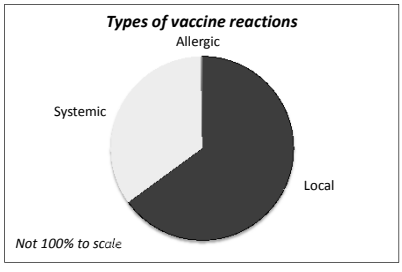
Advisory Committee on Immunization Practices (ACIP)

- Task force appointed by the Centers for Disease Control and Prevention (CDC)
- 15 voting members
  - Medical and public health experts
- Recommendations based on scientific evidence and expert opinion
  - Approved by CDC and published in *MMWR*

Morbidity and Mortality Weekly Report (MMWR) website. http://www.cdc.gov/mmwr/. Accessed January 6, 2015.

Immunization Strategies and Monitoring *Clinical Pearls – Adverse Reactions*

Do I need to monitor my patient for a reaction following vaccine administration?



Immunization Strategies and Monitoring *Clinical Pearls – Adverse Reactions*

Syncope

- 80% occur within 15 minutes of vaccination
  - Sit or lie down during vaccination
  - Consider having patients wait (while sitting or lying) for 15 minutes following vaccination
    - — At minimum for adolescents
    - — Longer until symptoms resolve if patient feels dizzy or light headed after vaccination

Vaccine Adverse Event Reporting System (VAERS). https://vaers.hhs.gov. Accessed Dec 2, 2014.

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Immunization Strategies and Monitoring *Clinical Pearls – Adverse Reactions*

Febrile seizures

- Primarily in children 6 months – 5 years old
  - VZV vaccine - <1 in 1,000
  - MMR vaccine – 1 in 3,000
  - DTaP vaccine – 1 in 14,000

  〉 MMRV – 1 in 1,250
- Usually occur within 5-12 days of vaccination
- Prevention/Management
  - Acetaminophen? Requires use during entire period at risk
  - Minimize # of vaccines given at once? No evidence

DTaP=diphtheria/tetanus/acellular pertussis; MMR=measles/mumps/rubella; MMRV=MMR+varicella; VZV=varicella zoster virus
MacDonald SE, et al. CMAJ. 2014;186:824-9

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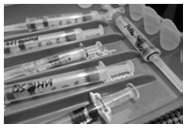
Immunization Strategies and Monitoring *Clinical Pearls – Timing of Vaccines*

Should I administer vaccines together or spread them out over multiple clinic visits?

- Most vaccines can be safely administered together while not interfering with efficacy
  - Avoids need for additional visits
  - Avoids risks of cancellations/non-compliance



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Immunization Strategies and Monitoring
Clinical Pearls – Timing of Vaccines

- History of febrile seizures - Not predictive of future episodes
- Pediatric patients - Involve them in the decision
- Inactive Vaccines - Most can be administered simultaneously
  - Separate pneumococcal conjugate vaccine (PCV) and Menactra®, meningococcal (Groups A,C,Y & W-135) polysaccharide diphtheria toxoid conjugate vaccine, by at least 4 weeks[1,2]

[1]Prevention and Control of Meningococcal Disease: Recommendations from ACIP. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6202a1.htm. Accessed December 13, 2014. [2]Menactra [package insert]. Swiftwater, PA: Sanofi Pasteur Inc; 2014.

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Immunization Strategies and Monitoring
Clinical Pearls – Timing of Vaccines

Live vaccines – simultaneous administration[1-3]

- 3-fold higher risk of varicella disease when given MMR and VZV vaccines on different visits (but within 28 days)
- Administer live vaccines together or separate ≥ 4 weeks

Live vaccines and blood products[4]

- Passive antibodies interfere with response to live vaccines
- Administer live vaccines 2 weeks prior to blood products or after passive antibody has cleared (range, 3-11 months)

[1]Petralli JK, et al. N Engl J Med. 1965;273:198-201. [2]Petralli JK, et al. Lancet. 1965;2:401-5. [3]Verstraeten T, et al. Pediatrics. 2003;112:98-103. [4]ACIP Vaccine Recommendations, Table 5. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm#Tab5. Accessed Dec 13, 2014.

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Immunization Strategies and Monitoring
Clinical Pearls – Timing of Vaccines

Live vaccines and antiviral therapy

- Antivirals (i.e. acyclovir) may interfere with response to VZV vaccine
  - Stop antiviral therapy ≥ 24 hours before vaccine administration
  - Do not resume antiviral therapy until at least 2 weeks after vaccine administration

ACIP Vaccine Recommendations, Special Situations. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm. Accessed Dec 13, 2014.

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Immunization Strategies and Monitoring *Controversies – Coagulation Disorders*

My patient has thrombocytopenia or is on anticoagulation. Can I safely administer vaccines?

- Subcutaneous (SC) – yes
  - Live vaccines
- Intramuscular (IM) – controversial
  - Most inactivated vaccines
  - Adjuvant-containing

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Immunization Strategies and Monitoring *Controversies - Coagulation Disorders*

Vaccination – low platelets or anticoagulation

- Bleeding disorders (hemophilia, von Willebrand's)[1,2]
  - Hepatitis B – IM only; 4% mild bruising[1]
  - Hepatitis B – SC versus IM: similar efficacy, IM 2x more hematomas[2]
- Therapeutic anticoagulation[3,4]
  - Influenza – SC versus IM: similar efficacy and toxicity[3]
  - Influenza – IM caused no local symptoms, no bleeding[4]

[1]Evans DIK et al. BMJ. 1990;300:1694-5. [2]Carpenter SL, et al. Haemophilia. Online Nov 7, 2014. doi:10.1111/hae.12569. [3]Delafuente JC, et al. Pharmacother. 1998;18:631-6. [4]Raj G, et al. Arch Intern Med. 1995;155:1529-31.

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Immunization Strategies and Monitoring *Controversies – Coagulation Disorders*

Vaccination – low platelets or anticoagulation

- ACIP – Give IM if physician deems it is safe
- Additional recommendations
  - Fine-gauge needle (≥ 23), apply firm pressure for 2 minutes, do not rub site

ACIP Vaccine Recommendations. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm. Accessed Dec 13, 2014.

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Immunization Strategies and Monitoring *Controversies - Immunosuppression*

How does recent or current immunosuppressive therapy impact response to vaccinations?

- Corticosteroids
- Rituximab
- Others
  - Adalimumab
  - Etanercept
  - Infliximab

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Immunization Strategies and Monitoring *Controversies - Immunosuppression*

Corticosteroids post-HCT

- Post-HCT relapse
- GVHD
- BOS

Rituximab peri/post-HCT

- Conditioning
- Post-HCT maintenance
- Post-HCT relapse
- Chronic GVHD
- PTLD

BOS=bronchiolitis obliterans syndrome; GVHD=graft-versus-host disease; HCT=hematopoietic cell transplantation; PTLD=post-transplant lymphoproliferative disorder

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Immunization Strategies and Monitoring *Controversies – Corticosteroid Effect*

Vaccine trials in post-HCT recipients taking corticosteroids:

- Details lacking
  - Drug
  - Dose
  - Duration
- Correlations between immunosuppression and vaccine response inconsistent

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Immunization Strategies and Monitoring *Controversies – Corticosteroid Effect*

CDC/ACIP – ok to administer LIVE vaccines to an otherwise immunocompetent person if corticosteroid therapy is:

- < 14 days duration
- < 20 mg/day or ≤ 2 mg/kg/day prednisone (or equivalent); maintenance, physiologic dose
- Alternate day treatment with short-acting steroids
- Route other than oral or intravenous

➔Otherwise, delay LIVE vaccines ≥ 1 month

ACIP Vaccine Recommendations. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm. Accessed Dec 13, 2014.

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Immunization Strategies and Monitoring *Controversies – Rituximab Effect*

Rituximab effects on vaccine response

- Rheumatoid arthritis[1] – trivalent influenza vaccine
  - <25% seroprotected (rituximab), 25-70% (methotrexate), 50-90% (healthy controls)
- Lymphoma[2] – H1N1 influenza vaccine
  - 0% response (rituximab group) v 82% response (controls)
- Post-HCT
  - Pertussis response 0% in rituximab recipients[3]
  - PCV response ↓ 50% in children who received rituximab[4]

[1]van Assen S, et al. Arthritis Rheum. 2010;62:75-81. [2]Yri O, et al. Rituximab. Blood. 2011;118:6769-71. [3]Small T, et al. BBMT. 2009;15:1538-42. [4]Pao M, et al. BBMT. 2008;14:1022-30.

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Immunization Strategies and Monitoring *Controversies – Markers of Immunity*

Consider measuring markers of immune competence prior to vaccination:

- B cell immunity
  - CD19+ cell # – "normal" range decreases with age
  - IgG > 500 mg/dL
  - Isohemagglutinin titer ≥ 1:8
- T cell immunity
  - CD4+ > 200 cells/µL
  - Phytohemagglutinin levels >50-75% LLN

Pao M et al. *Biol Blood Marrow Transplant*. 2008;14:1022-30. Small TN et al. *Blood. 2009;114:Abstract 1137*. Kussmaul SC et al. *Bone Marrow Transplant*. 2010;45:1602-6.

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Immunization Strategies and Monitoring
Audience Response Question #1

Syncope following vaccine administration is most common in what age group?

a. Young children < 5 years old
b. Adolescents and young adults
c. Middle aged adults
d. Elderly
e. Syncope is not a side effect of vaccine administration

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Immunization Strategies and Monitoring
Audience Response Question #2

True/False: Corticosteroids only interfere with the response to LIVE vaccines. They have little impact on the response to inactivated vaccines.

a. True
b. False

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Immunization Strategies and Monitoring
Conclusions

- Monitor for reactions for 15 minutes following vaccine administration in adolescents
- Consider products that interfere with vaccine response and adjust timing of vaccines accordingly
- Do not alter the U.S. FDA-approved route of vaccine administration unless the risk outweighs the benefit
- Avoid live vaccines in patients on extraphysiologic doses of corticosteroids or within 6 months of rituximab. Avoid inactive vaccines, except in cases of outbreaks

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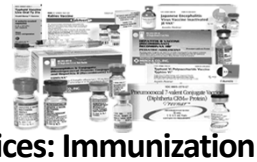

Best Practices: Immunization Strategies and Monitoring Adult Perspectives

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University of North Carolina BMT Program

- Staff
  - 7 Attending physicians
  - 6 Advanced Practice Professionals (NP/PA)
  - 3 Pharmacy FTEs
- Capacity
  - 16-bed inpatient unit
  - ~180 transplants per year
  - Outpatient Clinic
    - — Pharmacy presence since 2010

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UNC BMT Immunization Protocol

Bone Marrow and Stem Cell Transplant Manual

UNC HEALTH CARE

Policy Name	**BMT Program Immunization Policy**
Policy Number	**BMT 0018**
Date this Version Effective	**Mar 2013**
Responsible for Content	**BMT Program**

- Outlines:
  - Recommended vaccines
  - Recommended vaccine schedule

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Immunization Screening Strategies

- Daily clinic huddle
  - Identification of patients scheduled for vaccines
- Review of clinic schedule
  - Post-transplant timing
  - Immune status
    - — Post-transplant complications
    - — Current or recent medications

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Patient Screening and Assessment

High Risk Immunosuppression

Steroid therapy	≥ 20 mg prednisone or equivalent x 14 days
Biologic immune modulators	Rituximab, TNF-α-inhibitors, IL-2 inhibitors
Active chemotherapy	2 weeks prior 3 months after
CD4 T-lymphocyte count	<200 cells/mm^3

Rubin et al. *Clin Infect Dis*. 2014 Feb;58(3):e44-100.

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Patient Screening and Assessment

- Acute illness
  - Vaccination not contraindicated: Mild illnesses (diarrhea, URI with or without low grade fever, other low-grade febrile illness)
  - Sufficient reason to postpone: moderate to severe acute illness
- Concerns
  - Superimposing adverse events of vaccine on underlying illness
  - Attributing symptoms of illness to vaccine

ACIP Vaccine Recommendations, Contraindications and Precautions http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm. Accessed Dec 14, 2014.

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Patient Screening and Assessment

Anti-infectives

Antibacterials

May interfere with response to oral typhoid

Antivirals for Herpes Viruses

May interfere with response to varicella-containing vaccines

Antivirals for Influenza Virus

May interfere with response to live attenuated influenza vaccine

ACIP Vaccine Recommendations, Special Situations. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm. Accessed Dec 14, 2014.

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Patient Screening and Assessment

Blood Products

2 weeks prior
3-11 months after
Intervals relevant for live vaccine administration only

Thrombocytopenia

Platelets ≥ 50 x 10^9/L
Absence of bleeding complications

Anticoagulation

Platelets ≥ 50 x 10^9/L
Absence of bleeding complications

ACIP Vaccine Recommendations, Spacing of Vaccines and Antibody-Containing Products. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm. Accessed Dec 14, 2014.

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Immunization Schedule

- Initiation of immunization series
  - 6 months post-transplant – influenza vaccine
  - 1 year post-transplant for other vaccines
- Timing considerations
  - Autologous vs. allogeneic patients
  - Early vs. late vaccination
  - Simplify screening efforts
- Together vs. separate
  - Each vaccine series administered together

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UNC Immunizations Policy

Vaccination	6 month	12 month	14 month	16 month	24 month
DTaP		X	X	X	
Tdap		X	X	X	
Hep B		X	X	X	
Hib		X	X	X	
IPV		X	X	X	
MCV4		X	X	X	
PCV-13		X	X	X	
PPSV-23					X
MMR					X
Influenza	X				

DTaP – Diphtheria and tetanus toxoids and acellular pertussis; Tdap – Tetanus toxoid. reduced dose diphtheria toxoid, and acellular pertussis; Hep B – Hepatitis B vaccine; Hib – Haemophilus influenzae B conjugate vaccine; IPV – Inactivated polio virus; Meningococcal conjugate vaccine 4-valent; PCV-13 - Pneumococcal conjugate vaccine 13-valent; PPSV-23 – Pneumococcal polysaccharide vaccine 23-valent; MMR – Measles, mumps, rubella

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Influenza Virus Inactivated Vaccine 0.5 mL intramuscularly – administer during flu season annually, beginning 6 months post-SCT

Date/Lot
[redacted]

DTaP, Hepatitis B and Inactivated Polio Vaccines (Pediarix®) 0.5mL intramuscularly - *inactive*

	Date/Lot		Date/Lot		Date/Lot
12 month		14 month		16 month	

Haemophilus influenzae type b (Hib) conjugate vaccine 0.5 mL intramuscularly - *inactive*

	Date/Lot		Date/Lot		Date/Lot
12 month		14 month		16 month	

Pneumococcal conjugate vaccine (PCV13, Prevnar-13®) 0.5 mL intramuscularly - *inactive*

	Date/Lot		Date/Lot		Date/Lot
12 month		14 month		16 month	

Pneumococcal polysaccharide vaccine (PPSV23, Pneumovax®) subcutaneously - *inactive*

		Date/Lot
[redacted]	24 month	

Measles-Mumps-Rubella (MMR) 1ml subcutaneously – ***live attenuated (***give only to patients not on immunosuppressive therapy and without GVHD***)***

		Date/Lot
[redacted]	24 month	

Outpatient Therapy Plans

BMT POST-TRANSPLANT VACCINES Plan start: **12/5/2014** [redacted] Propert

Add a new order | Order | Select Unsigned

List view: No Grouping | Category | Interval | Protocol | Sho

	Interval	Remaining	Category
Physician communication order	Once	1/1	A. Immunizations (6 Months)
Administer flu vaccine during flu season annually, beginning 6 months post stem cell transp therapy plan. Protocol: BMT POST-TRANSPLANT VACCINES			
DTaP HepB IPV combined vaccine IM	Once	1/1	B. Immunizations (12 Months)
Order details Protocol: BMT POST-TRANSPLANT VACCINES			
HiB PRP-T conjugate vaccine 4 dose IM	Once	1/1	B. Immunizations (12 Months)
Order details Protocol: BMT POST-TRANSPLANT VACCINES			
Meningococcal conjugate vaccine 4-valent IM	Once	1/1	B. Immunizations (12 Months)
Order details Protocol: BMT POST-TRANSPLANT VACCINES			
Pneumococcal conjugate vaccine 13-valent less than 5yo IM	Once	1/1	B. Immunizations (12 Months)
Order details Protocol: BMT POST-TRANSPLANT VACCINES			

Vaccine Monitoring

- Adverse events
  - Monitored in clinic after RN administration
- Antibody titers
  - Not routinely monitored
  - Lack of standard threshold for adequate response and subsequent revaccination
  - Vaccination timing

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Donors and Household Contacts

- Donor vaccination
  - No standard donor vaccine program
  - Practical and ethical concerns
- Household contacts
  - No formal program
  - Recommend to all patients that family and close contacts follow recommended vaccine schedules

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Successes and Challenges

- Screening efforts
  - Must commit to daily patient review
  - Opportunity for students and residents
- Immunization passport
- Billing and reimbursement
  - Reimbursement for pediatric vaccines?
  - Clinic nursing productivity for vaccine administration
- EMR updates
  - Transition from paper to electronic templates
  - Formulary management and template maintenance

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Immunization Strategies and Monitoring
Audience Response Question #3

JG is a 67 YOM 4 months post-allogeneic HCT . He has not begun receiving his post-HCT vaccines. He has cutaneous GVHD and has been stable on prednisone 10 mg PO daily for 3 weeks . His physician asks you about giving him DTaP, Hep B, IPV, Hib, and PCV13 vaccines today in clinic. JG also informs you that his 5-year old nephew is coming to visit and is due for his last set of booster vaccines.

What would your recommendations be regarding vaccines for JG and his nephew?

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Immunization Strategies and Monitoring
Audience Response Question #3

a. Give all vaccines to JG and clear his nephew to receive his booster vaccines.
b. Delay all vaccines for both JG and his nephew until he is at least 6 months post-HCT.
c. Delay all vaccines for JG until he is at least 6 months post-HCT, but clear his nephew to receive his booster vaccines.
d. Give all vaccines to JG, but delay his nephew until he is at least 6 months post-transplant.

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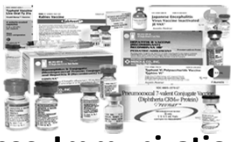

Best Practices: Immunization Strategies and Monitoring - Pediatric Perspectives

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ASBMT CIBMTR

University of Minnesota Blood and Marrow Transplant Program - Pediatric

- 10 Attending physicians
- 5 Advanced Practice Professionals (NP/PA)
- 2 Pharmacy FTEs
- ~90 transplants per year
- 24-bed inpatient unit
- Outpatient Clinic
  - Pharmacy presence since 2007

ASBMT CIBMTR

University of Minnesota Blood and Marrow Transplant Vaccination Guidelines

Vaccine	12 months post HCT	14 months post HCT	24 months post HCT
DTaP *< 7 years of age*	X	X	X
Tdap *≥ 7 years of age*	X	X	X
Hib	X	X	X
PCV13	X	X	X
IPV	X	X	X
Meningococcal *11-21 years of age*	X		
Quadrivalent HPV	X		
MMR			X
Varicella			X
Influenza (not live)	Yearly administration recommended beginning pre-HCT and resuming ≥ 60 days post-HCT		

HPV = Human papilloma virus

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Immunization Schedule

- Vaccine orders in Epic therapy plans for anniversary visits
- First vaccine: Influenza
  - >/= 60 days post-transplant (range 2-6 months)
- Other vaccinations
  - 12 months post-transplant
- Allogeneic vs. Autologous

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Future Schedule Updates

- Remove age differences and administer DTaP to all patients
  - FDA approved: 6 months to <7 years of age due to increased adverse effects to DT if > 7 years of age
  - Tdap with poor response in study with autologous patients regardless of timing to transplant[1,2]
  - Adult HCT patients received DT with lower rate of local side effects compared to previously vaccinated immunocompetent adults[3]
  - Consistent with IDSA, ASBMT, and CIBMTR recommendations[3,4]

IDSA = Infectious Disease Society of America, ASBMT = American Society of Blood and Marrow Transplantation, CIBMTR = Center for International Blood and Marrow Transplant Research

1. Small TN et al. *Biol Blood Marrow Transplant*. 2009;15:1538-1542
2. Papadopoulos E et al. *Blood*. 2008;112:2214.
3. Rubin LG et al. *Clin Infect Dis*. 2014;58:e44-e100.
4. Tomblyn M et al. *Biol Blood Marrow Transplant*. 2014;15:1143-1238.

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Future Schedule Updates

- Add PPSV23 as a fourth pneumococcal dose and consider giving PCV13 earlier (6 or 9 months?)
  - Study demonstrated that PPSV23 administered after 3 dose series of conjugate vaccine increased response rate (RR)[1]
    - Consistent with IDSA, ASBMT, and CIBMTR recommendations[2,3]
  - Study also demonstrated that late immunization (6-9 months vs. 3 months) offers a better long-lasting response yet delays protection after HCT[1]
    - Is 12 MONTHS too late?
- Add 2nd MMR dose in our pediatric population
  - Multiple studies have demonstrated higher response rate to MMR in adults than children post HSCT[4-7]
  - Consistent with IDSA, ASBMT, and CIBMTR recommendations[2,3]

1. Cordonnier C et al. *Clin Infect Dis*. 2009;48:1392-1401. 2. Rubin LG et al. *Clin Infect Dis*. 2014;58:e44-e100.
3 Tomblyn M et al. *Biol Blood Marrow Transplant*. 2014;15:1143-1238 4. Machado CM et al. *Bone Marrow Transplant*. 2005;35:787-791. 5. Spoulou V et al. *Bone Marrow Transplant*. 2004;33:1187-1190. 6. King SM et al. *Bone Marrow Transplant*. 1996;17:633-636. 7. Ljungman P et al. *J Infect Dis*. 1989;159:610-615.

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Typical day of vaccination

"How many shots am I getting???"

- 12-month visit
  - DTaP-hepatitis B recombinant-IPV (Pediarix®)
  - Haemophilus B conjugate (ActHIB®)
  - Pneumococcal conjuate(Prevnar 13®)
  - Meningococcal conjugate (Menactra®)*
  - Quadrivalent HPV (Gardasil®)*
- 24 month visit
  - DTaP-hepatitis B recombinant-IPV (Pediarix®)
  - Haemophilus B conjugate (ActHIB®)
  - Pneumococcal conjugate (Prevnar 13®)
  - Measles, mumps and rubella (MMR)
  - Varicella virus live (Varivax®)

*Based on age

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Patient assessment and screening

- Consider vaccination delay in patients with high risk immunosuppression
  - Active treatment of acute GVHD
    - No vaccines (especially live) until 6 months off immunosuppression
      - Exception: yearly influenza vaccine
  - Current chemotherapy
    - Consider delaying until 3 months post-chemotherapy
  - Biologic immune modulators
    - Within 6 months of rituximab

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Patient assessment and screening

- Thrombocytopenia and/or anticoagulation
  - Physician decision on a per patient basis
- Meningococcal vaccine: Who should receive it?
  - All patients 11-21 years of age
  - Patients >21 years of age living in dormitory setting or military barracks
  - Sickle cell patients ("functional asplenia") and patients with anatomic asplenia >1 year of age

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Patient assessment and screening

- Quadrivalent HPV vaccine: Who should receive it?
  - Our current protocol:
    - Females > 11 years of age and <26 years who are without evidence of the papilloma virus
    - 1st dose: 12 months post HCT, 2nd dose: 14 months post HCT and 3rd dose: 18 months post HCT
  - No data regarding HPV vaccine in HCT recipients, so no recommendations from IDSA, ASBMT or CIBMTR
  - Next protocol update: include male HCT recipients to be in line with ACIP/CDC recommendations

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Vaccine Monitoring

- Adverse events
  - Monitored in clinic after RN administration
- Antibody titers
  - Not routinely monitored
  - Lack of standard threshold for adequate response and subsequent revaccination
  - Vaccination timing

Donors and Household Contacts

- Donor vaccination
  - No standard donor vaccine program
- Household contacts

VACCINATIONS FOR HOUSEHOLD CONTACTS

Vaccine	Recommendations for Use
Hepatitis A	Routine hepatitis A Vaccination is recommended in endemic areas or during outbreaks, according to existing ACIP guidelines.
Influenza	*Household contacts:* Influenza vaccination is strongly recommended during each influenza season beginning in the season before the transplant and continuing up to at least 24 months post-HCT. All household contacts of immune compromised HCT recipients should be vaccinated annually as long as these conditions persist. Use of FluMist, the nasal form of the vaccine should not be administered to those in contact with immunocompromised HCT patients. If the nasal form is taken, these individuals should not be in contact with HCT patients for 7 days post-vaccination, as this may pose a transmission risk of the virus to patients.
Polio [a]	Vaccine (not routinely recommended for adults) should be given when indicated per ACIP guidelines. Injectable inactivated polio vaccine (IPV) is to be used.
Measles-mumps-rubella [b]	MMR vaccination is recommended for all persons who are ≥ 12 months old and who are not pregnant or immunocompromised.
Varicella (Varivax)	If a household contact of a HCT recipient develops a post-vaccination rash within 42 days of varicella vaccination, contact precautions should be implemented. Direct chicken pox exposure in a HCT recipient with no history of chicken pox or prior vaccination should have VZV serology test and should receive antiviral therapy (acyclovir) until seropositivity is confirmed.

University of Minnesota Blood and Marrow Transplantation Vaccine Protocol

Family Immunization Program at UMMCH

- Influenza and pertussis vaccines (when appropriate) offered free of charge to family members
  - Inactivated Influenza only
  - Specific to families that are unable to access their primary caregiver, local outpatient clinic, or local pharmacy
- Unit nurses assess families for vaccination status

Strategies for successful vaccination in pediatric patients

"No, I don't want a shot! It will hurt!!!"

- Distraction
  - Play games
  - Watch movies
  - Child Family Life
- Schedule vaccines with sedated procedure
- Give patient control
- Numbing cream, e.g. lidocaine/prilocaine cream (EMLA®)

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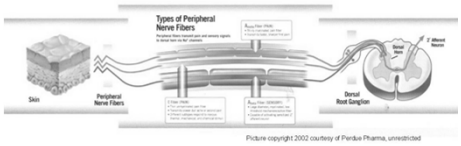
Strategies for successful vaccination in pediatric patients

- Other tools
  - Buzzy® - "physiologic pain blocker"
    - Vibrations and cold confuse nerve fibers according to the Gate Control Theory



http://buzzy4shots.com/

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Audience Response Question #4

Which of the following is a recommended strategy used in the pediatric population to help provide a more "pleasant" vaccination experience?

a. Distraction with movies and games
b. Coordination of vaccinations with a sedated procedure
c. Allow the child to choose which vaccines he/she will receive and which ones he/she will not
d. Application of numbing cream prior to vaccine
e. Answers a, b and d
f. All of the above

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