Immunization in Cancer Patients:
An Often Forgotten or Ignored Responsibility

E.J. Bow MD, MSc., D. Bacteriol., FRCPC
Infectious Diseases, Haematology/Oncology, Blood and Marrow Transplant
Director, Infection Control Services,
CancerCare Manitoba
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Objectives

1. To understand the principles of immunization in cancer and blood disorder patients
2. To be aware of the live and attenuated vaccines that are available in Canada
3. To understand the timing of immunization for bacterial and viral diseases
4. To review recommendations for asplenia, family/household members and international travel
A 66-year old man has T2N1M0 Stage III adenocarcinoma of the sigmoid colon based upon a complete resection September 15th. His medical oncologist recommends adjuvant FOLFOX every 2 weeks over 8 cycles beginning mid-October. His family physician reminds him about his annual influenza vaccination and advises him to consider the pneumococcal conjugate and polysaccharide vaccines.

When should the vaccines be administered?
A. Administer the influenza (TIV) and pneumococcal polysaccharide (PPV-23) vaccines on day 1 of FOLFOX?
B. Administer TIV and pneumococcal conjugate (PCV-13) vaccine now and PPV-23 in 9 months?
C. Administer TIV and PPV-23 at the beginning of Flu season in December?
D. Administer Oseltamivir and phenoxyethyl penicillin throughout Flu season?
Immunizations in Cancer Patients

**Principles**

1. **Why . . .**
   - I. Children: to prevent illness
   - II. Adults: to prevent severe illness and death

2. **Responsibility . . .**
   - I. Shared between specialist and primary care provider
   - II. Patients and family / household contacts

   “Circle of Protection”
Immunizations in Cancer Patients

**Principles**

3. What . . .
   
   I. Inactivated vaccines
   
   II. Live vaccines
Immunizations in Cancer Patients

**Principles**

4. **Timing . . .**

i. **Prior** to planned chemo/radio/immuno-suppressive therapy
   a) Live vaccines: ≥ 4 weeks prior
   b) Inactivated vaccines: ≥ 2 weeks prior

ii. **During** chemo/radio/immuno-suppressive therapy
   a) Inactivated vaccines:
      Considered incomplete . . . re-dosing is controversial
   a) Live vaccines: *Contraindicated, except . . .*

iii. **After** chemo/radio/immuno-suppressive therapy
   a) ≥ 3 months after completion of treatments
   b) ≥ 6 months after anti-B-cell antibodies
   c) HSCT: Inactivated = 6-12 months post-SCT
   d) HSCT: Live = 24 months post-SCT, free of GvHD & treatment
Vaccines available in Canada

**VACCINES**

**INACTIVATED**

**BACTERIAL**

- Cholera . . . . O1-strains
- Diphtheria . . D, d
- Tetanus . . . . T, t
- Pertussis . . . P, p
- Haemophilus . . Hib
- Meninococcal . . Men-C,P ACYW, 4CMenB
- Pneumococcal . . PCVx, PPV23
- Typhoid . . . . Typh-I,
  HA-Typh-I

**VIRAL**

- Hepatitis A . . HA
- Hepatitis B . . HB
- Japanese B
- encephalitis . . JE
- HPV . . . . . HPV2, HPV4
- Poliovirus . . IPV
- Rabiesvirus . . HDCV, PCECV
- Tick-borne
- encephalitis . . TBE
- Influenza . . . TIV

**BACTERIAL**

- Typhoid . . . . Typh-O

**LIVE**

- Measles, Mumps, Rubella . . . . MMR
- Rotavirus . . . . Rot-1
- Smallpox . . . . Vaccinia
- Yellow Fever . . . YF
- Varicella . . . . Var
- Herpes zoster . . . Zos
- Influenza . . . . LAIV

**VIRAL**

- Measles,
  Mumps,
  Rubella . . . . MMR
- Rotavirus . . . . Rot-1
- Smallpox . . . . Vaccinia
- Yellow Fever . . . YF
- Varicella . . . . Var
- Herpes zoster . . . Zos
- Influenza . . . . LAIV

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Vaccines for asplenia or hyposplenia

VACCINES

INACTIVATED

BACTERIAL

Pneumococcal . . . PCV_{13} \Rightarrow PPV_{23}

Tetanus,

diphtheria,

acellular

pertussis . . . . . . Tdap

Haemophilus . . . Hib_{unimmunized}

Meninococcal . . . Men-C-ACYW

VIRAL

TIV\text{annually}

Influenza . . .

HPV . . . . . . HPV2, HPV4

Hepatitis A . . HA \pm HB, IViG

Hepatitis B . . HB_{40\mu g @ 0,1,6 \text{ mo}}

Measles, Mumps,

Rubella . . . . MMR \geq 1957

Varicella . . . . Var, \geq 1980

Herpes zoster . . Zos, \geq 60 \text{ yr}

LIVE

Haemophilus

Measles,

TIV\text{annually}

Var,

Rubella

Varicella

Herpes zoster
Recommendations for Patients Undergoing Chemotherapy

Cancer or Blood Disorder

- ≥ 14 days before beginning chemotherapy
- ≥ 3 months after completing chemotherapy

Pneumococcal vaccine previously

- YES
- PPV_{23} ≥ 1 Yr
- PCV_{13} ≥ 8 wk
- PPV_{23} 5 yr Post
- PPV_{23}

- NO
- PCV_{13} ≥ 8 wk
- PPV_{23} 5 yr Post
- PPV_{23}

Meningococcal vaccine previously

- YES
- C-ACWY Q 5 yr
- C-ACWY
- C-ACWY Q 5 yr

- NO
- C-ACWY ≥ 8 wk
- C-ACWY ≥ 8 wk
- No boosters
- C-ACWY C-ACWY Q 5 yr

Haemophilus influenzae b vaccine previously

- YES
- C-Hib
- No Revaccination required
- C-Hib
- No boosters

- NO
- Influenza ≥ 8 wk
- 4CMenB ≥ 8 wk
- No boosters

Influenza 

- YES
- TIV
- Annual re-vaccination before “FLU” season
- TIV

No boosters

- C-Hib
- No boosters

- TIV
Vaccines for household members of immunocompromised patients

INACTIVATED

BACTERIAL

VIRAL

LIVE

VIRAL

LAIV . . . . . . Excepct HSCT
< 2 mo post-
SCT

Measles, Mumps,
Rubella . . . . . MMR ≥ 1957
Varicella* . . . Var, ≥ 1980
Herpes zoster*. . Zos, ≥ 60 yr

*Avoid contact until skin lesions have resolved

Household members of an immunocompromised patient may receive all inactivated vaccines as recommended by the CDC-ACIP.
Vaccines for international travel for immunocompromised patients

**INACTIVATED**
- **BACTERIAL**
- **VIRAL**

Immunocompromised patients may receive all inactivated vaccines as recommended by the CDC-ACIP, ≥ 3 months after planned chemotherapy

- *V. cholerae O1*
- *Typh-I, HA-Typh-I*
- *Men-C-ACWY, 4CMenB*
- *Tdap*
- *HAHB*
- *TBE*
- *JE*
- *JEHB*
- *IPV*
- *PCECV*
- *HDCV, PCECV*
- *TIV*

**LIVE**
- **BACTERIAL**
- **VIRAL**

Immunocompromised patients should not receive live vaccines with some exceptions
When to administer the influenza vaccine to patients receiving on-going chemotherapy

Allen U, Doucette K, Bow EJ. PHAC Guideline January 26th, 2010

Regimens: 14-day, 21-day, 28-day

Immune response requires 7-14 days
Best to immunize before planned CT/RT

Administration within 7 days of CT reduces vaccine responsiveness
D+1 . . . No
D+7 . . . Probably not

D+14 of 14-day regimen . . . No
D+14 of 21-28 day regimen . Maybe
D+21 of 21-day regimen . . . No
D+21 of 28-day regimen . . . Maybe
D+28 of 28-day regimen . . . No

Take Home Messages

1. Immunization = Standard supportive care
2. Safety: Inactivated 🎉 Live 😞
3. Timing: BEFORE (≥ 4 weeks, live; ≥ 2 weeks, inactivated)
   AFTER (≥ 3 months) end-of-treatment
4. Annual influenza immunization is a MUST
5. Family members ≈ “herd immunity”
6. Cancer patients can travel safely, but it depends where you go!
Question:

Remember the 66-year old man with T2N1M0 Stage III adenocarcinoma of the sigmoid colon based upon a complete resection September 15th whose medical oncologist recommended adjuvant FOLFOX every 2 weeks over 8 cycles beginning mid-October and whose family physician advised him regarding his annual influenza vaccination and to consider pneumococcal conjugate and polysaccharide vaccines.

*When should those vaccines be administered?*
Select the best response…

A. Administer the influenza (TIV) and pneumococcal polysaccharide (PPV-23) vaccines on day 1 of FOLFOX?

B. Administer TIV and PCV-13 now and PPV-23 in 9 months?

C. Administer TIV and PPV-23 at the beginning of Flu season in December?

D. Administer oseltamivir and phenoxymethyl penicillin throughout Flu season?
Select the best response…

A. Administer the influenza (TIV) and pneumococcal polysaccharide (PPV-23) vaccines on day 1 of FOLFOX? **Nope! Poor response**

B. Administer TIV and PCV-13 now and PPV-23 in 9 months? **Yup! Great for TIV, but incomplete for IPD . . .**

C. Administer TIV and PPV-23 at the beginning of Flu season in December? **NOT ideal . . . Perhaps day +7 of a cycle**

D. Administer oseltamivir and phenoxydimethyl penicillin throughout Flu season? **Consider post-exposure oseltamivir . . . Otherwise NO**